



data communications

Installation and Operation Manual

# ***ASM-20***

***Synchronous/Asynchronous  
Short Range Modem***



# ASM-20

## Synchronous/Asynchronous Short Range Modem Installation and Operation Manual

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RAD warrants to DISTRIBUTOR that the hardware in the ASM-20 to be delivered hereunder shall be free of defects in material and workmanship under normal use and service for a period of twelve (12) months following the date of shipment to DISTRIBUTOR.

If, during the warranty period, any component part of the equipment becomes defective by reason of material or workmanship, and DISTRIBUTOR immediately notifies RAD of such defect, RAD shall have the option to choose the appropriate corrective action: a) supply a replacement part, or b) request return of equipment to its plant for repair, or c) perform necessary repair at the equipment's location. In the event that RAD requests the return of equipment, each party shall pay one-way shipping costs.

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This Agreement shall be construed and governed in accordance with the laws of the State of Israel.

# General Safety Instructions

The following instructions serve as a general guide for the safe installation and operation of telecommunications products. Additional instructions, if applicable, are included inside the manual.

## Safety Symbols



**Warning**

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**This symbol may appear on the equipment or in the text. It indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.**

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**Danger of electric shock! Avoid any contact with the marked surface while the product is energized or connected to outdoor telecommunication lines.**

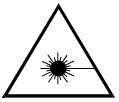
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**Protective earth: the marked lug or terminal should be connected to the building protective earth bus.**

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**Warning**

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**Some products may be equipped with a laser diode. In such cases, a label with the laser class and other warnings as applicable will be attached near the optical transmitter. The laser warning symbol may be also attached.**

**Please observe the following precautions:**

- **Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the transmitter.**
- **Do not attempt to adjust the laser drive current.**
- **Do not use broken or unterminated fiber-optic cables/connectors or look straight at the laser beam.**
- **The use of optical devices with the equipment will increase eye hazard.**
- **Use of controls, adjustments or performing procedures other than those specified herein, may result in hazardous radiation exposure.**

**ATTENTION: The laser beam may be invisible!**

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In some cases, the users may insert their own SFP laser transceivers into the product. Users are alerted that RAD cannot be held responsible for any damage that may result if non-compliant transceivers are used. In particular, users are warned to use only agency approved products that comply with the local laser safety regulations for Class 1 laser products.

Always observe standard safety precautions during installation, operation and maintenance of this product. Only qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this product. No installation, adjustment, maintenance or repairs should be performed by either the operator or the user.

# Handling Energized Products

## General Safety Practices

Do not touch or tamper with the power supply when the power cord is connected. Line voltages may be present inside certain products even when the power switch (if installed) is in the OFF position or a fuse is blown. For DC-powered products, although the voltages levels are usually not hazardous, energy hazards may still exist.

Before working on equipment connected to power lines or telecommunication lines, remove jewelry or any other metallic object that may come into contact with energized parts.

Unless otherwise specified, all products are intended to be grounded during normal use. Grounding is provided by connecting the mains plug to a wall socket with a protective earth terminal. If an earth lug is provided on the product, it should be connected to the protective earth at all times, by a wire with a diameter of 18 AWG or wider. Rack-mounted equipment should be mounted only in earthed racks and cabinets.

Always make the ground connection first and disconnect it last. Do not connect telecommunication cables to ungrounded equipment. Make sure that all other cables are disconnected before disconnecting the ground.

## Connection of AC Mains

Make sure that the electrical installation complies with local codes.

Always connect the AC plug to a wall socket with a protective ground.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Always connect the power cord first to the equipment and then to the wall socket. If a power switch is provided in the equipment, set it to the OFF position. If the power cord cannot be readily disconnected in case of emergency, make sure that a readily accessible circuit breaker or emergency switch is installed in the building installation.

In cases when the power distribution system is IT type, the switch must disconnect both poles simultaneously.

## Connection of DC Mains

Unless otherwise specified in the manual, the DC input to the equipment is floating in reference to the ground. Any single pole can be externally grounded.

Due to the high current capability of DC mains systems, care should be taken when connecting the DC supply to avoid short-circuits and fire hazards.

DC units should be installed in a restricted access area, i.e. an area where access is authorized only to qualified service and maintenance personnel.

Make sure that the DC supply is electrically isolated from any AC source and that the installation complies with the local codes.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Before connecting the DC supply wires, ensure that power is removed from the DC circuit. Locate the circuit breaker of the panel board that services the equipment and switch it to the OFF position. When connecting the DC supply wires, first connect the ground wire to the corresponding terminal, then the positive pole and last the negative pole. Switch the circuit breaker back to the ON position.

A readily accessible disconnect device that is suitably rated and approved should be incorporated in the building installation.

If the DC mains are floating, the switch must disconnect both poles simultaneously.

## Connection of Data and Telecommunications Cables

Data and telecommunication interfaces are classified according to their safety status.

The following table lists the status of several standard interfaces. If the status of a given port differs from the standard one, a notice will be given in the manual.

Ports	Safety Status	
V.11, V.28, V.35, V.36, RS-530, X.21, 10 BaseT, 100 BaseT, Unbalanced E1, E2, E3, STM, DS-2, DS-3, S-Interface ISDN, Analog voice E&M	SELV	Safety Extra Low Voltage:  Ports which do not present a safety hazard. Usually up to 30 VAC or 60 VDC.
xDSL (without feeding voltage), Balanced E1, T1, Sub E1/T1	TNV-1	Telecommunication Network Voltage-1:  Ports whose normal operating voltage is within the limits of SELV, on which overvoltages from telecommunications networks are possible.
FXS (Foreign Exchange Subscriber)	TNV-2	Telecommunication Network Voltage-2:  Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are not possible. These ports are not permitted to be directly connected to external telephone and data lines.
FXO (Foreign Exchange Office), xDSL (with feeding voltage), U-Interface ISDN	TNV-3	Telecommunication Network Voltage-3:  Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are possible.

**Always connect a given port to a port of the same safety status. If in doubt, seek the assistance of a qualified safety engineer.**

Always make sure that the equipment is grounded before connecting telecommunication cables. Do not disconnect the ground connection before disconnecting all telecommunications cables.

Some SELV and non-SELV circuits use the same connectors. Use caution when connecting cables. Extra caution should be exercised during thunderstorms.

When using shielded or coaxial cables, verify that there is a good ground connection at both ends. The earthing and bonding of the ground connections should comply with the local codes.

The telecommunication wiring in the building may be damaged or present a fire hazard in case of contact between exposed external wires and the AC power lines. In order to reduce the risk, there are restrictions on the diameter of wires in the telecom cables, between the equipment and the mating connectors.

**Caution**

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To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cords.

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**Attention**

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Pour réduire les risques d'incendie, utiliser seulement des conducteurs de télécommunications 26 AWG ou de section supérieure.

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Some ports are suitable for connection to intra-building or non-exposed wiring or cabling only. In such cases, a notice will be given in the installation instructions.

Do not attempt to tamper with any carrier-provided equipment or connection hardware.

## Electromagnetic Compatibility (EMC)

The equipment is designed and approved to comply with the electromagnetic regulations of major regulatory bodies. The following instructions may enhance the performance of the equipment and will provide better protection against excessive emission and better immunity against disturbances.

A good earth connection is essential. When installing the equipment in a rack, make sure to remove all traces of paint from the mounting points. Use suitable lock-washers and torque. If an external grounding lug is provided, connect it to the earth bus using braided wire as short as possible.

The equipment is designed to comply with EMC requirements when connecting it with unshielded twisted pair (UTP) cables. However, the use of shielded wires is always recommended, especially for high-rate data. In some cases, when unshielded wires are used, ferrite cores should be installed on certain cables. In such cases, special instructions are provided in the manual.

Disconnect all wires which are not in permanent use, such as cables used for one-time configuration.

The compliance of the equipment with the regulations for conducted emission on the data lines is dependent on the cable quality. The emission is tested for UTP with 80 dB longitudinal conversion loss (LCL).

Unless otherwise specified or described in the manual, TNV-1 and TNV-3 ports provide secondary protection against surges on the data lines. Primary protectors should be provided in the building installation.

The equipment is designed to provide adequate protection against electro-static discharge (ESD). However, it is good working practice to use caution when connecting cables terminated with plastic connectors (without a grounded metal hood, such as flat cables) to sensitive data lines. Before connecting such cables, discharge yourself by touching earth ground or wear an ESD preventive wrist strap.

## FCC-15 User Information

This equipment has been tested and found to comply with the limits of the Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the Installation and Operation manual, may cause harmful interference to the radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



## Canadian Emission Requirements

This Class A digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

### Warning per EN 55022 (CISPR-22)

***Warning***

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This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user will be required to take adequate measures.

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***Avertissement***

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Cet appareil est un appareil de Classe A. Dans un environnement résidentiel, cet appareil peut provoquer des brouillages radioélectriques. Dans ces cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.

---

***Achtung***

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Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

---

# Declaration of Conformity

**Manufacturer's Name:** RAD Data Communications Ltd.

**Manufacturer's Address:** 24 Raoul Wallenberg St.  
Tel Aviv 69719  
Israel

declares that the product:

**Product Name:** ASM-20

conforms to the following standard(s) or other normative document(s):

<b>EMC:</b>	EN 55022: 1998	Information technology equipment, radio disturbance characteristics, limits and methods of measurement.
	EN 50024: 1998	Information technology equipment, immunity characteristics, limits and methods of measurement.
<b>Safety:</b>	EN 60950: 2000	Safety of information technology equipment.

## Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 89/336/EEC, the Low Voltage Directive 73/23/EEC and the R&TTE Directive 99/5/EC for wired equipment. The product was tested in a typical configuration.

Tel Aviv, 22 January, 2003



Haim Karshen  
VP Quality

**European Contact:** RAD Data Communications GmbH, Otto-Hahn-Str. 28-30, 85521  
Ottobrunn-Riemerling, Germany

# Quick Start Guide

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If you are familiar with ASM-20, use this guide to prepare it for operation. Perform the following steps for both the local and the remote units.

1. Disconnect all cables from the units.
2. Open the units.
3. Adjust the jumpers. See [Chapter 2, Installation and Setup](#).

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**Note**

*Make sure that there is only one clock source in the application: one modem INT or EXT and the other modem RCV (LBT).*

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4. Configure the DTE parameters. See [Chapter 2, Installation and Setup](#).
5. Configure the line parameters. See [Chapter 2, Installation and Setup](#).
6. Close the units.
7. Connect the units to the DTEs.
8. Turn on the units.
9. Connect the units to the line. The units should begin operating within a few seconds.



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## **Appendix A. Ethernet Interface**

## **Appendix B. IR-G.703 Codirectional Interface (64 kbps)**

## **Appendix C. IR-X.21B Interface Module**

## **Appendix D. DTE Interface Connectors**

## **Appendix E. Connection to RS-422**

## **Appendix F. Unit Case Assembly**

# Chapter 1

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## Introduction

---

### 1.1 Overview

The ASM-20 short range modem operates synchronously or asynchronously at full-or half-duplex, over unconditioned lines. ASM-20 has a range of up to 23 km (14 mi) and operates at selectable data rates from 19.2 kbps to 256 kbps.

ASM-20 uses conditioned diphase modulation (EUROCOM Std. D1) to provide immunity from background noise, eliminate normal line distortion, and enable efficient transmission and reception of serial data over a twisted pair cable.

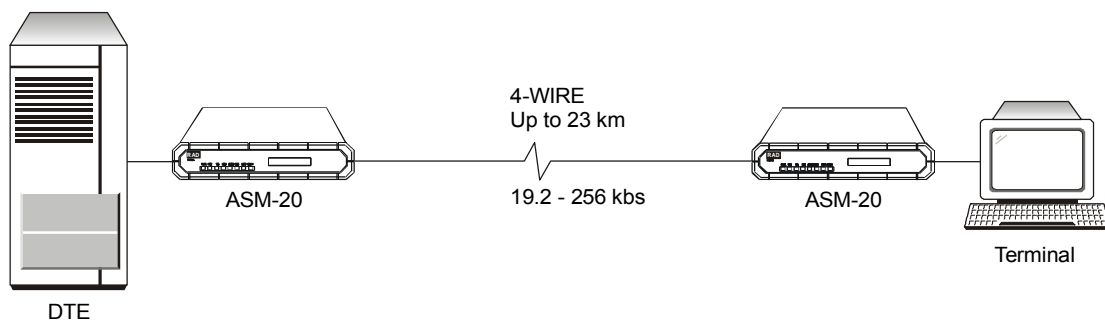
Transmit timing is provided internally, or derived externally from the data terminal or regenerated from the receive signal.

Receive timing is regenerated from the data.

### Applications

The following diagrams illustrate ASM-20 in a variety of applications:

- Point-to-point
- Modem link
- Tail-end for digital networks.



*Figure 1-1. Point-to-point Application*

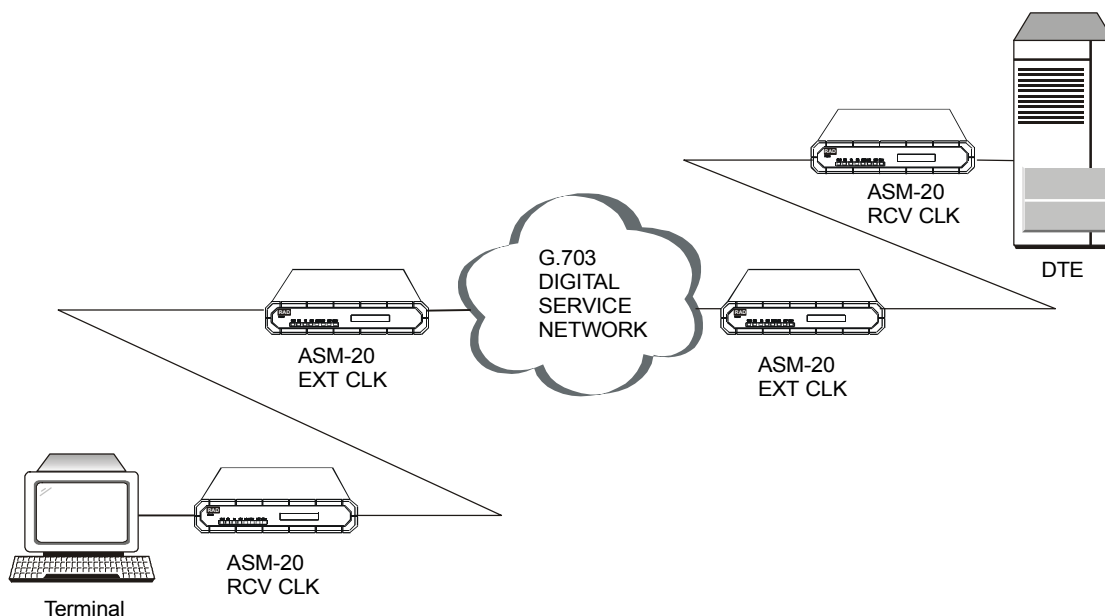


Figure 1-2. G.703 Modem Link Application

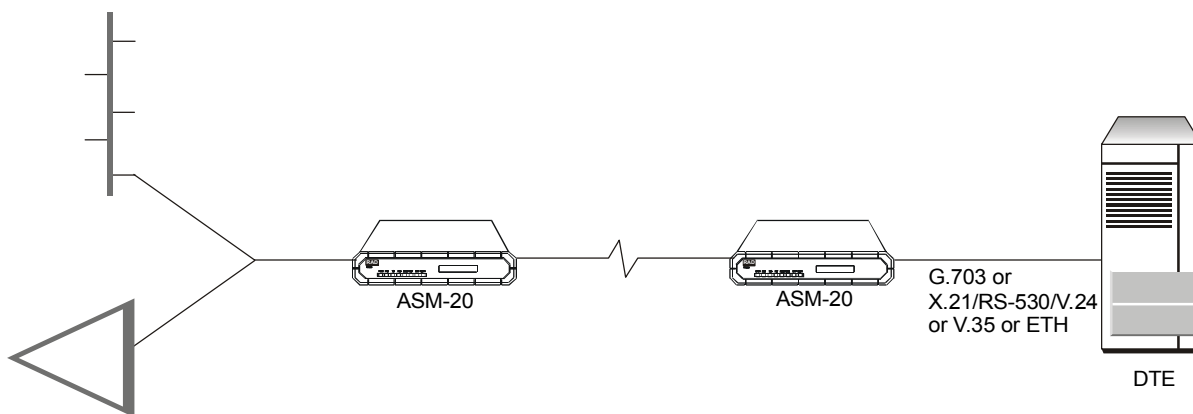


Figure 1-3. Tail-end for Digital Network Application

## Features

ASM-20 features V.54 diagnostic capabilities for performing local analog loopback and local and remote digital loopback. The operator at either end of the line may test both modems and the line when in digital loopback mode. The loopback is controlled by either front panel push buttons or via the DTE interface.

## Options

The following DTE interface options are available:

- V.24/RS-232(up to 64 kbps)
- V.35
- X.21
- RS-530
- V.36
- G.703 (64 kbps co-directional)



- Built-in Ethernet bridge.

Connection to an RS-449/V.36 interface is accomplished via the RS-530 interface (see [Appendix A, Ethernet Interface](#)). ASM-20 incorporates a built-in Bit Error Rate Tester (BERT). The internal BERT allows complete testing of both modems and the line without external test equipment. A front panel switch generates a pseudo-random test pattern (511-bit, according to ITU/V.52) for testing end-to-end connectivity. The ERROR LED will flash when a bit error is encountered.

---

## 1.2 Physical Description

ASM-20 is available as a desk-top unit or a rack-mountable card for a 19" rack. The rack can carry up to 14 ASM-20 cards which provide a 25-pin D-type connection to the digital interface. Optional interface adapters for V.35, X.21, G703 and ETH are available. The ASM-20/R card can detect and indicate power failure on the remote ASM-20 standalone unit. The RPF LED will light up if remote power failure occurs.

### Front Panel

*Figure 1-4* shows a general view of ASM-20.



*Figure 1-4. ASM-20*

### LEDs

All controls (push button and LED indicators) are located on the ASM-20 front panel (see *Figure 1-4*). A description of the front panel can be found in [Controls and Indicators](#) in [Chapter 3](#).

### Jumpers

A description of the jumpers can be found in [Setting Internal Jumpers and Switches](#) in [Chapter 2](#). See [Table 2-1](#) and [Figure 2-3](#).

### Rear Panel

*Figure 1-5. ASM-20 Rear Panel with V.35 Interface*

shows an example of an ASM-20 rear panel. A description of the rear panel can be found in *Electrical Installation* in *Chapter 2*.

The line and interface connectors are located on the rear panel of ASM-20 (see *Figure 1-5*).

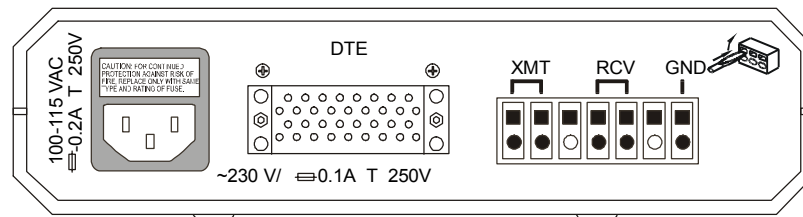


Figure 1-5. ASM-20 Rear Panel with V.35 Interface

### 1.3 Functional Description

This section contains functional descriptions of the circuit blocks in ASM-20, primarily those circuits which are required for configuring the modem (see *Figure 1-6*).

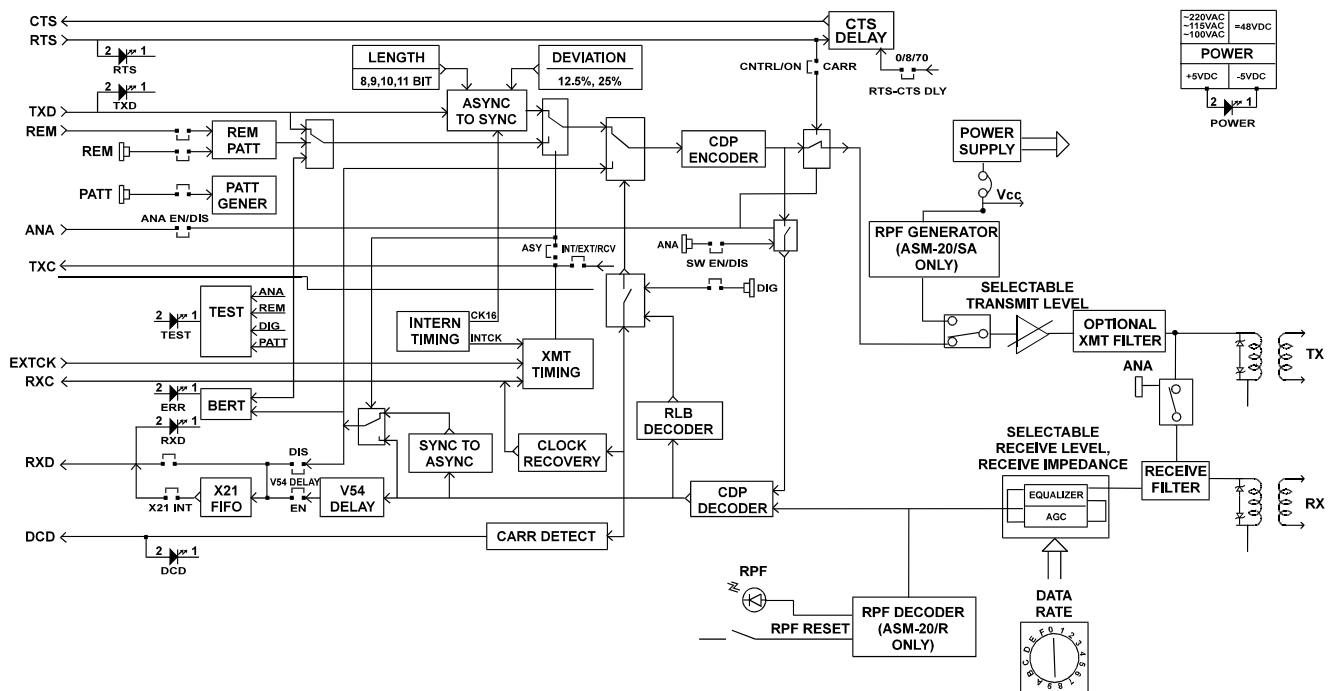


Figure 1-6. ASM-20 Block Diagram

#### Encoder

The encoder receives data from the DTE, then modulates the data using the CDD “conditional diphas modulation” technique.

- 4-wire full-duplex
- 4-wire half-duplex.

## Modulation Timing

This circuit supplies the transmit clock to the encoder. Three clock sources are available:

- Internal oscillator
- External from the DTE
- Loop clock derived from the receive signal.

Setting the XMT CLK jumper determines the timing option. See [Setting Internal Jumpers and Switches](#) in [Chapter 2](#) for more information.

## XMT Level (optional)

Two options are available for the XMT level (signal level): 0 and -6 dBm. XMT level is controlled by the XMT LVL jumper. See [Setting Internal Jumpers and Switches](#) in [Chapter 2](#) for more information on the XMT LVL jumper.

An optional output filter to the line is available. This filter can be ordered in compliance with British Telecom and other PTT requirements.

## Receiver

The receiver comprises several circuits as shown in the block diagram (see [Figure 1-6](#)):

- The RECEIVE FILTER removes all the out-band frequencies.
- The AUTOMATIC EQUALIZER comprises several equalizers which are activated according to baud rate.
- The digital AGC automatically compensates for the attenuation of the line.

## Remote Power Failure (RPF)

The Remote Power Failure feature allows the user at a central location to detect a power failure in a remote modem. The remote power failure feature can only be configured when the ASM-20/SA standalone unit (remote) operates opposite the rack-mounted card ASM-20/R (central). When a power failure occurs, ASM-20/SA transmits a special tone which is detected by ASM-20/R and causes the ERR/RPF LED to light up. A special push button located on the front panel of ASM-20/R allows the user to reset the RPF LED. The RPF jumper in the standalone unit enables or disables the feature. The RPF feature should be disabled for multipoint applications.

## V.54 Diagnostics

V.54 loops are activated either by manual front panel push buttons or via the DTE interface. The push buttons and the DTE interface can be enabled or disabled separately by the SWITCH EN, ALB DTE, RLB DTE jumpers respectively. See [Setting Internal Jumpers and Switches](#) in [Chapter 2](#), for more information.

## Async to Sync Converter

ASM-20 has an internal asynchronous to synchronous converter and synchronous to asynchronous converter (used for asynchronous data).

A synchronous transmission is provided by internal conversion from asynchronous to synchronous mode in compliance with ITU V.22 bis. In this standard, the modem compensates for frequency deviation between the modem and the DTE by adjusting the length of the stop bit of the async character. If the modem's frequency is lower than the DTE, the local converter deletes one stop bit in every four (25%) or eight (12.5%) characters. The remote converter will add a shorter stop bit (shorter by 12.5% or 25%) before sending the data to the remote DTE.

A suitable operation of the ASYNC to SYNC converter is selected by adjusting the proper character length and frequency deviation setting (dip switch bank), see [Figure 2-3](#) and [Table 2-2](#).

## X.21 Buffer (for X.21 interface)

To allow tail-end connection on an X-21 interface, a buffer is provided on received data. When ASM-20 is used in external clock configuration, set jumper JP2 to EXT. When internal or receive clock configuration is used, set the jumper to the opposite side. See [Appendix C, IR-X.21B Interface Module](#) for more information.

## Test Pattern Generator and Receiver

This feature allows for easy and quick testing of the local modem as well as the communication link. When the PATT button on the front panel is activated, the circuit sends and checks a standard 511-bit pseudo random pattern. If errors are encountered, the ERROR LED remains ON or blinks.

The test can be carried out in local analog loopback, in remote digital loopback or in normal point-to-point operation opposite a remote ASM-20 modem. Press the PATT push button on the remote unit or connect a Bit Error Rate Tester which uses the standard 511-bit pattern.

## X.21 External Clock Buffer Option

Available with X.21 interface model only. See [Appendix C, IR-X.21B Interface Module](#) for more information.

## G.703 DTE Interface

Available with G.703 interface model only. See [Appendix B, IR-G.703 Codirectional Interface \(64 kbps\)](#) for more information.

## 1.4 Technical Specifications

<b>Transmission Line</b>	<i>Type</i>	Unloaded twisted pair 19 to 26 AWG
	<i>Range</i>	See <a href="#">Table 1-1</a>
	<i>Level</i>	Strap-selectable to 0 dBm or -6 dBm
	<i>Transmit Impedance</i>	150Ω or LOW (strap selectable)
	<i>Receive Impedance</i>	150Ω or HIGH (strap selectable)
	<i>Return Loss</i>	Greater than 15 dB
	<i>Carrier</i>	Controlled by RTS or constantly ON
	<i>Modulation</i>	Conditional diphase European Std. D1
<b>Digital Interface</b>	<i>Type</i>	V.24/RS-232 via 25-pin D-type, (up to 64 kbps only), female connector
		V.35 via 34-pin female connector
		X.21 via 15-pin D-type female connector
		RS-530 (RS-422) via 25-pin D-type female connector
		V.36 (RS-449) via 37-pin female connector using mechanical cable adapter provided with the product
		G.703 Codirectional (64 kbps) via terminal block or RJ-45
		Built-in Ethernet bridge via RJ-45 connector or BNC
	<i>Data Rates - selectable</i>	Sync: 19.2, 32, 48, 56, 64, 72, 96, 112, 128, 144, 192, 256 kbps
		Async: 19.2, 28.8, 38.4, 57.6, 115.2 kbps
	<i>RTS/CTS Delay</i>	Switch selectable to: - 0 ms - 9 ms - 70 ms
	<i>Length of Word</i>	8, 9, 10, 11
	<i>Stop Bits</i>	1, 1.5, 2

<b>Diagnostics</b> (Complies with the V.54 Standard)	<i>Digital Loopback</i>	Local (DIG), activated by a manual switch  Remote (REM), activated by a manual switch or by a control signal from the DTE interface connector
	<i>Analog Loopback</i>	Local (ANA), activated by a manual switch or by a control signal from the DTE interface connector
	<i>Pattern</i>	Test pattern activated by manual switch
<b>Timing Elements</b>	<i>Receive Clock</i>	Derived from the receive signal
	<i>Transmit Clock</i>	Derived from 3 alternative sources:  Internal oscillator  External from the DTE  Loop clock derived from the receive signal
<b>Indicators</b>	<i>Power</i>	PWR (green)
	<i>Request to Send</i>	RTS (yellow)
	<i>Transmit Data</i>	TD (yellow)
	<i>Receive Data</i>	RD (yellow)
	<i>Data Carrier Detect</i>	DCD (yellow)
	<i>Test</i>	TEST (red)
	<i>Bit errors</i>	Err (yellow)
<b>Electrical</b>	<i>Power Supply</i>	115 or 230 V ( $\pm 10\%$ ) 47 to 63 Hz; 5W -48 VDC or 24 VDC
<b>Physical</b>	<i>ASM-20 Modem</i>	Height: 44 mm/ 1.7 in Width: 215 mm/ 8.5 in Depth: 243 mm/ 9.6 in Weight: 1.1 kg / 2.4 lb
	<i>ASM-20-R Card</i>	Dimensions: Fits ASM-MN-214 modem rack  Weight: 290 gm / 10.1 oz
<b>Environment</b>	<i>Temperature</i>	0° - 50°C / 32° - 122°F
	<i>Humidity</i>	Up to 90%, non-condensing

Table 0-1 Approximate Range

Baud Rate	19 AWG (0.8 mm)		22 AWG (0.6 mm)		24 AWG (0.5 mm)		26 AWG (0.4 mm)	
	km	miles	km	miles	km	miles	km	miles
256	3.75	2.3	2.85	1.75	2.25	1.4	1.9	1.2
192	6.0	3.7	4.5	2.8	3.5	2.2	2.7	1.7
144	10.6	6.6	6.75	4.2	4.5	2.8	3.4	2.1
128	12.4	7.7	7.3	4.5	5.0	3.1	3.6	2.2
115.2*	12.8	7.8	7.65	4.75	5.25	3.3	3.8	2.5
112	12.8	8.0	8.0	5.0	5.5	3.4	4.0	2.5
96	13.0	8.1	8.3	5.15	6.0	3.7	4.15	2.6
72	15.0	9.3	9.4	5.8	6.25	3.9	4.3	2.65
64	17.6	11.0	11.0	6.8	7.5	4.6	5.3	3.3
57.6*	18.8	11.7	11.75	7.3	8.0	5.0	5.6	3.5
56	18.8	11.7	11.75	7.3	8.0	5.0	5.6	3.5
48	19.4	12.0	12.2	7.6	8.25	5.2	5.8	3.6
38.4*	20	12.5	12.5	7.8	8.5	5.3	6.0	3.7
32	20.5	12.75	12.85	8.0	8.75	5.4	6.2	3.85
28.8*	20.5	12.75	12.85	8.0	8.75	5.4	6.2	3.85
19.2**	23.0	14.0	14.0	8.7	9.75	6.0	7.0	4.3

\* Async baud rate

\*\* Sync/Async baud rate





# Chapter 2

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## Installation and Setup

---

### 2.1 Introduction

This chapter provides instructions for mechanical and electrical installation of the ASM-20 standalone model.

- For rack installation of the ASM-20, see [Chapter 5, Card Cage Version](#).
- For ETH interface installation see [Appendix A, Ethernet Interface](#).
- For G.703 interface installation, see [Appendix B, IR-G.703 Codirectional Interface \(64 kbps\)](#).
- For X.21B interface installation, see [Appendix C, IR-X.21B Interface Module](#).
- For V.36 interface installation, see [Appendix E, Connection to RS-422](#).

After installation has been completed, see [Chapter 3, Operation](#) for operating information and system checkout to assure normal operation.

---

### 2.2 Site Preparation and Prerequisites

Install ASM-20 within 1.5m (5 ft) of a grounded, easily accessible AC outlet. The outlet should be capable of furnishing 115 VAC or 230 VAC (depending on rated voltage of unit).

For DC units, the DC supply must be adequately isolated from the mains supply. To prevent a fire hazard, the line supply lead should be fused or current limited.

Allow at least 90 cm (36 in) of frontal clearance for operating and maintenance accessibility. Ensure that there is at least 10 cm (4 in) clearance at the rear of the unit for signal lines and interface cables.

---

### 2.3 Package Contents

The ASM-20 package includes the following items:

- ASM-20
- AC cord
- 48 VDC plug (optional)
- Adapter cable for the different interfaces (optional)
- ASM-20 Installation and Operation Manual.

---

## 2.4 Equipment Needed

ASM-20 is a standalone device designed to be placed on a tabletop or bench. It is delivered completely assembled. No provisions are made for bolting ASM-20 to the tabletop.

No special equipment is needed for installing ASM-20.

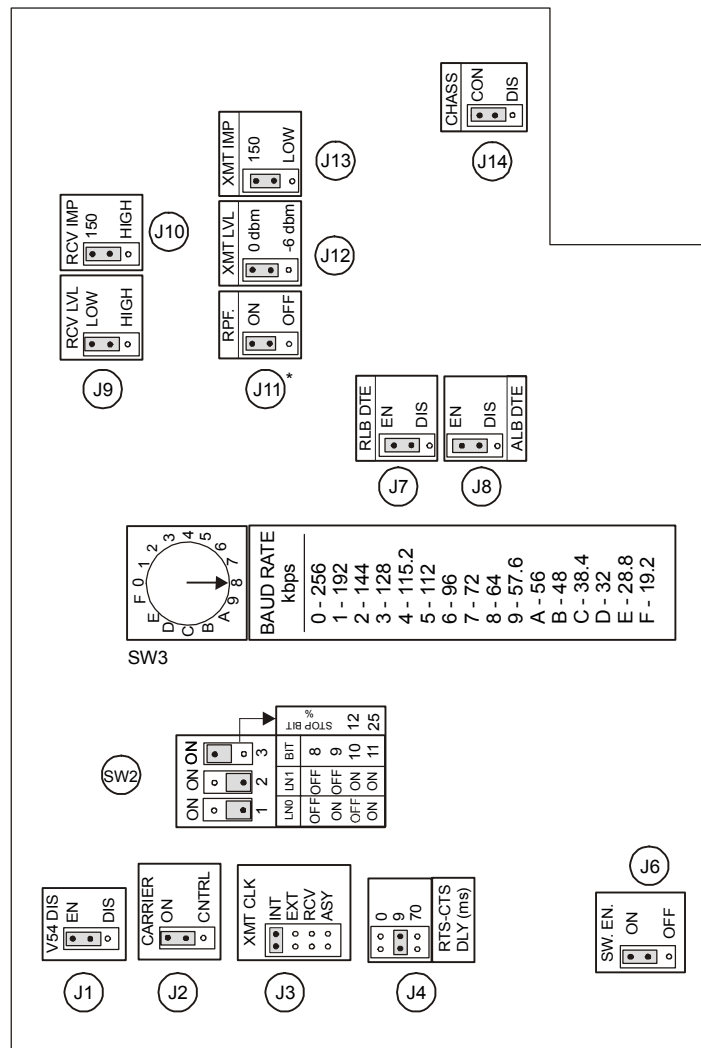
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## 2.5 Setting Internal Jumpers and Switches

► **To set the jumpers and switches:**

1. Disconnect the power cable.
2. Loosen the screws holding the bottom cover in place.
3. Remove the top cover.
4. Adjust the jumpers as required. See [Table 2-1](#).
5. Replace the top cover and tighten the retaining screws.



\* J11 - Only for standalone option

Figure 2-1. PCB Layout Diagram



### Warning

**Note**

**In certain locations where permanent excessive high voltages are present on the lines, disconnecting the signal ground from the chassis ground may render the unit unsafe for connection to unprotected telecommunication networks.**

For applications using an X.21 interface external clock (DTE timing source), connect the input clock to Pins 7(a) and 14(b) of the 15-pin connector. In X.21, one of the modems should be set to RCV clock.

*Table 2-1* specifies the strap selection settings. The jumper and switch identity numbers correspond to PCB Layout Diagram (see *Figure 2-1*).

Table 2-1. ASM-20 Strap Selection Settings

Jumper and Switch Identity	Function	Possible Settings**
J1 V54 DIS	Prevents activation of remote V.54 loops.	EN <b>DIS</b>
J2 CARRIER	Selects the transmit carrier mode. When ON, transmit carrier is constantly ON. When CNTRL, transmit carrier is ON only when RTS is High. In X.21, RTS is replaced by the CONTROL signal.	<b>ON</b> CNTRL
J3 XMT CLK	Selects the transmit timing signal from either: internal clock, external clock or receive clock and enables working in Asynchronous mode.	<b>INT</b> EXT RCV ASY
J4 RTS-CTS DLY (ms)	Selects the delay between RTS and CTS.	0 <b>9</b> 70
J6 SW. EN.	Enables activation of DIG, ANA and REM loopbacks via the front panel push buttons.	<b>ON</b> OFF
J7 RLB DTE	Enables Remote Loopback command from the DTE.	<b>EN</b> DIS
J8 ALB DTE	Enables Analog Loopback command from the DTE.	<b>EN</b> DIS
J9 RCV LVL	Selects the receiver sensitivity level required.	<b>LOW</b> HIGH
J10 RCV IMP	Selects receive line impedance.	<b>150Ω</b> HIGH
J11 RPF*	Enables the Remote Power Failure feature.	<b>ON</b> OFF
J12 XMT LVL	Selects the transmit output level to the line.	<b>0 dBm</b> -6 dBm
J13 XMT IMP	Selects the transmit line impedance.	<b>150Ω</b> LOW
J14 CHASS	The CON setting connects Signal Ground to Chassis Ground. The DIS setting disconnects them.	DIS <b>CON</b>

\* Only for standalone option

\*\* Factory settings are shown in bold.

Table 2-2. ASM-20 Strap Selection Settings (Cont.)

Jumper and Switch Identity	Function	Possible Settings **
SW2 ASYNC LENGTH (3 dip switches)	Select character length in async mode (see Table 2-3. Async Character Length Setting for further explanation).	<div>S1 S2 No. Bits</div> <div><b>OFF OFF 8</b></div> <div>ON OFF 9</div> <div>OFF ON 10</div> <div>ON ON 11</div> <div>S3</div> <div>OFF 25%</div> <div><b>ON 12.5%</b></div>
SW3 Baud Rate (kbps)	Selects the data rate.	<div>Rate</div> <div>0) 256 kbps</div> <div>1) 192 kbps</div> <div>2) 144 kbps</div> <div>3) 128 kbps</div> <div>4) 115.2 kbps <sup>\$</sup></div> <div>5) 112 kbps</div> <div>6) 96 kbps</div> <div>7) 72 kbps</div> <div><b>8) 64 kbps</b></div> <div>9) 57.6 kbps <sup>\$</sup></div> <div>A) 56 kbps</div> <div>B) 48 kbps</div> <div>C) 38.4 kbps <sup>\$</sup></div> <div>D) 32 kbps</div> <div>E) 28.8 kbps <sup>\$</sup></div> <div>F) 19.2 kbps <sup>\$\$</sup></div>

<sup>\$</sup> Async baud rate<sup>\$\$</sup> Async/Sync baud rate

\*\* Factory settings are shown in bold.

Table 2-3. Async Character Length Setting

Start Bit	Data Bits	Parity	Stop Bit	No. of Bits
1	5	NONE	2	8
1	6	NONE	1, 1.5, 2	8 9
1	6	ODD, EVEN	1, 1.5, 2	9 10
1	7	NONE	1, 1.5, 2	9 10
1	7	ODD, EVEN	1, 1.5, 2	10 11
1	8	NONE	1, 1.5, 2	10 11
1	8	ODD, EVEN	1, 1.5, 2	11

## 2.6 Connecting the Cables

The line and digital interface connectors (located on the rear panel of ASM-20) consist of a DTE interface connector and a five-screw terminal block. The DTE interface connector may be 34-pin for V.35 (see [Figure 2-2](#)), 15-pin for X.21 (see [Figure 2-3](#)) or 25-pin for RS-530/RS-422 or RS-232/V.24.

The terminal block provides a connection between transmit and receive twisted pair lines. The transmit and receive pairs are polarity insensitive. The transmit pair is connected to the terminals marked XMT, the receive pair is connected to the terminals marked RCV. If the cable is shielded, the shield may be connected to the terminal marked GND.

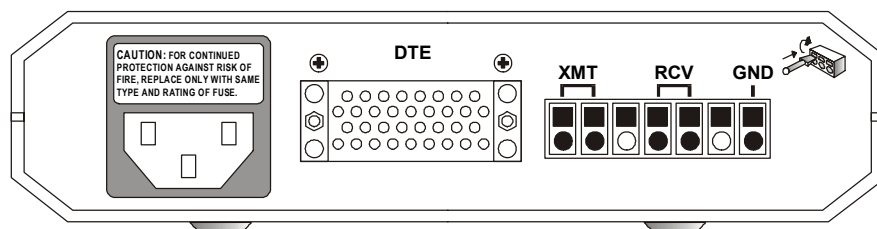


Figure 2-2. ASM-20 - V.35 Rear Panel

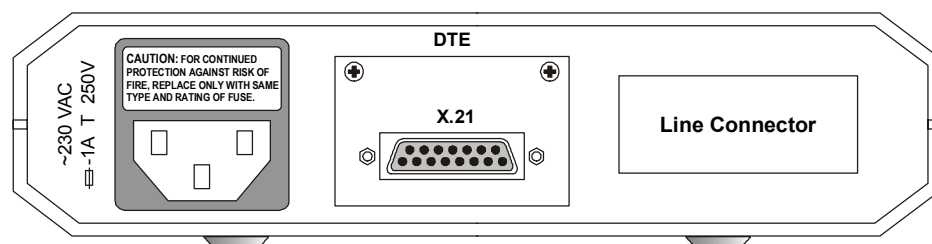


Figure 2-3. ASM-20 - X.21 Rear Panel

# Chapter 3

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## Operation

This chapter:

- Describes the controls and indicators of ASM-20 and their functions
- Explains the operation procedures
- Provides jumper and switch information.

Installation procedures given in [Chapter 2, Installation and Setup](#) must be completed and checked before attempting to operate the ASM-20.

---

### 3.1 Power On

Apply AC power by connecting the AC power cord to an acceptable AC source. The PWR LED should light up, indicating that the ASM-20 is on. If the local and remote ASM-20 units are in operation and passing data, the following indicator conditions will exist:

- PWR: On
- RTS: On or Flashing
- TD: Flashing or Off
- RD: Flashing or Off
- DCD: On or Flashing
- TEST: Off.

If you do not obtain the above LED indications following initial power on, check that the three test push buttons are not depressed.

---

### 3.2 Controls and Indicators

All controls (push button switches) and LED indicators are located on the ASM-20 front panel. Their functions are described in [Table 3-1](#) and correspond to the identification numbers in [Figure 3-1](#) and [Figure 3-2](#).

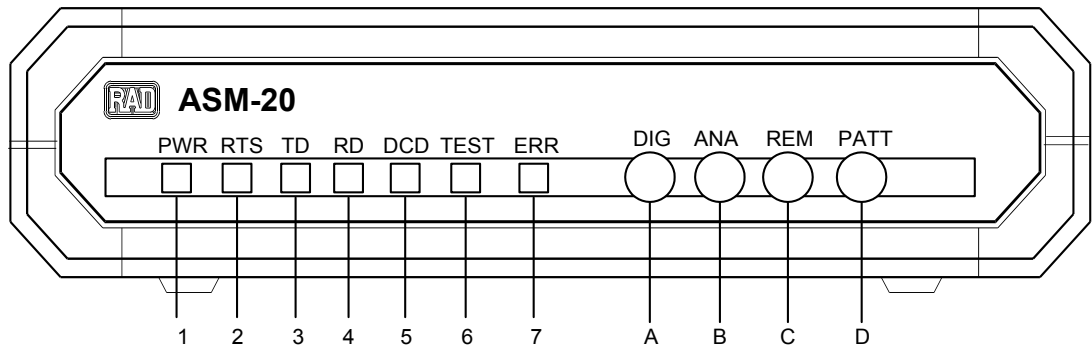


Figure 3-1. ASM-20/SA Front Panel

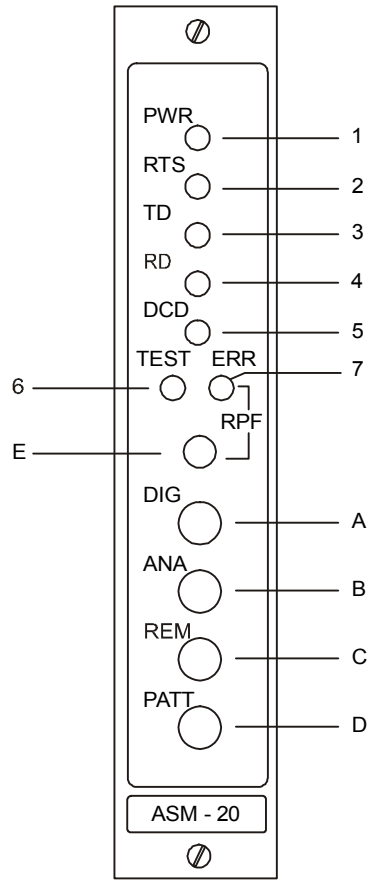


Figure 3-2. ASM-20R Front Panel



Table 3-1. Control and Indicator Functions

Item	Name	Type	Function
A	DIG	Pushbutton	The Digital Loopback switch causes the local ASM-20 to loop received data and clock back to its transmitter. Data Set Ready will turn off (see <a href="#">Figure 4-5</a> ).
B	ANA	Pushbutton	The Analog Loopback (V.54 Loop 3) switch causes the local ASM-20 to loop its transmitter output back to its receiver (see <a href="#">Figure 4-3</a> ). This loopback may also be activated from the DTE when DTE COMMAND ALB strap is set to EN.
C	REM	Pushbutton	The Remote Digital Loopback (V.54 Loop 2) switch causes the remote ASM-20 to loop received data and clock to its transmitter (see <a href="#">Figure 4-4</a> ). Data Set Ready will turn off. This loopback may be also activated from the terminal when DTE COMMAND RLB strap is set to RLB EN.
D	PATT	Pushbutton	The PATT switch causes the ASM-20 to send and receive a 511 test pattern. If errors are encountered,, the ERROR LED is ON or blinks. Receive Data and Clear to Send will turn off. <b>Note:</b> The CARRIER jumper should be set to ON; if set to CNTRL, the RTS signal must be high.
E	RPF RESET	Pushbutton	Resets ERR/RPF LED (only available in ASM-20/R).
1	PWR	LED Indicator	Green LED is on when power is on.
2	RTS	LED Indicator ITU 105	Yellow LED is on when terminal activates Request to Send.
3	TD	LED Indicator ITU 103	Yellow LED is on when steady SPACE is being transmitted. It flickers when data is transmitted.
4	RD	LED Indicator ITU 104	Yellow LED is on when steady SPACE is being received. It flickers when data is received.
5	DCD	LED Indicator ITU 109	Yellow LED is on when a valid receive signal is present.
6	TEST	LED Indicator ITU 142	Red LED is on when the ASM-20 is in any of the three loopback modes or PATT mode.
7	ERR/RPF	LED Indicator	ERR: Yellow LED goes ON momentarily when PATT switch is activated and then goes out. If there are errors in the test pattern, the LED blinks or remains ON. RPF: Indicates power failure in remote standalone units (ASM-20/R only). Reset by depressing RPF reset push button.

---

### 3.3 Operation

ASM-20 operates entirely unattended, except when the occasional monitoring of LED indicators is required.

#### Test Activation

In order to verify that the ASM-20 is operating correctly, use the internal BERT and analog loopback tests as described in *Bit Error Rate Tester (BERT)* in [Chapter 4](#) and *Local Test - Analog Loopback* in [Chapter 4](#).

#### Operational Jumper and Switch Changes

If you need to reconfigure the ASM-20 for a different type of operation, the jumpers and switches must be changed to correspond to the new operating mode.



**Warning**

---

**Only authorized or qualified personnel should have access inside the equipment. Disconnect the ASM-20 power cable before opening the top cover.**

---

For guidance in repositioning the jumpers and switches, see [Setting Jumpers and Switches](#) in [Chapter 2](#). The equipment will become unsafe for connection to telecommunication networks in some locations, if the signal ground is disconnected from the chassis ground.

---

### 3.4 Power Off

➤ **To turn off an AC powered ASM-20:**

Remove the AC power cord from the AC source.

➤ **To turn off a DC powered ASM-20:**

Turn off the circuit breaker that supplies the DC mains.

# Chapter 4

---

## Troubleshooting and Diagnostics

This chapter contains procedures for performing system diagnostic tests for ASM-20. Use the test procedures provided in this chapter to:

- Verify normal system operation
- Isolate faulty equipment in the event of failure.

Tests are activated by control push buttons on the ASM-20 front panel and monitored via LED indicators. For a description of the ASM-20 controls and indicators and their functions, see [Chapter 3, Operation](#).

---

### 4.1 Loop Test Procedure

The test switches and LED indicators built into ASM-20 allow rapid checking of the data terminals, ASM-20 and lines. Use the test procedures provided in this chapter to check normal system operation and isolate faulty equipment in the event of failure. Each test verifies the operational performance of a unit in the system or provides a positive indication of equipment failure.

Before testing operation of the data system equipment and line circuits, ensure that all units are turned on and correctly configured.

---

### 4.2 Bit Error Rate Tester (BERT)

The Bit Error Rate Tester (BERT) can be activated in any diagnostics test in which the test pattern transmitted is looped back to the BERT for comparison (see [Figure 4-1](#)).

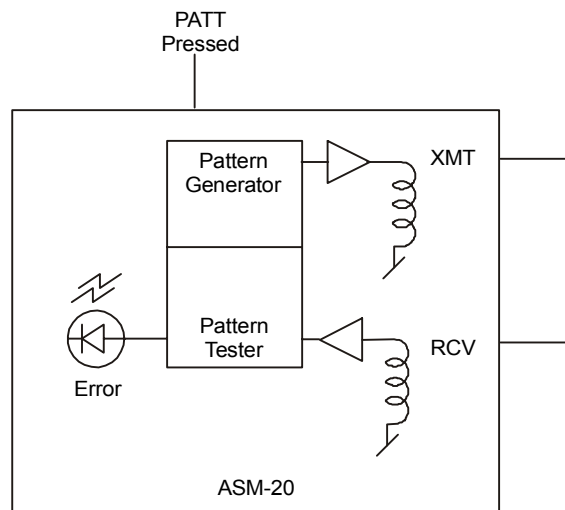


Figure 4-1. BERT Using Loops

Alternatively, the complete link can be tested when using two ASM-20 modems or an external BERT. Figure 4-2 illustrates the two options for testing a complete link:

- Press the PATT push button of the local modem and check the ERR/RPF LED. At the remote side check an external BERT.
- Press the PATT push button of the local and remote modems and check their ERR LEDs.

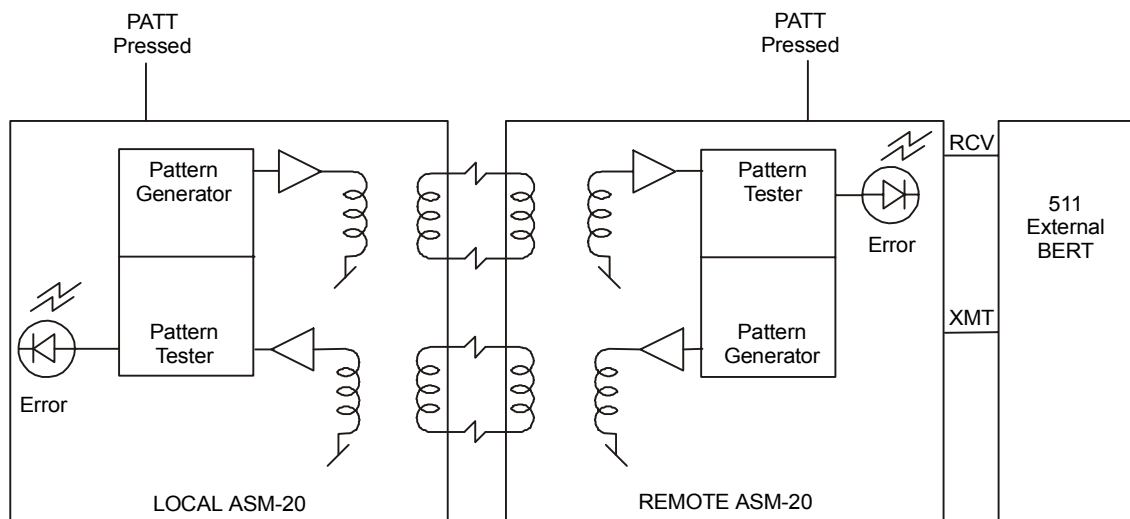


Figure 4-2. Two BERTs Operating End-to-End

### 4.3 Modem Self Test

The modem self test verifies that ASM-20 is operating correctly.

➤ **To verify that ASM-20 is operating correctly:**

1. Press the ANA (Analog Loopback) push button on the front panel. Both the TEST and DCD LEDs should light up. If the DCD LED does not light up, check that the CARRIER jumper is ON or that the RTS signal is ON (high).
2. Press the PATT push button. Verify that:
  - DCD LED is still lit up
  - TEST LED is still lit up
  - ERR LED lights up for a short period.

The ERR LED should then turn off. If it lights up or blinks, then ASM-20 is faulty and should be replaced. If the test executes correctly, restore all the push buttons and jumpers to the required position.

### 4.4 Local Test - Analog Loopback

This test checks the performance of the local modem, the local data terminal and the cables connecting them. Perform it separately at the local and remote sites.

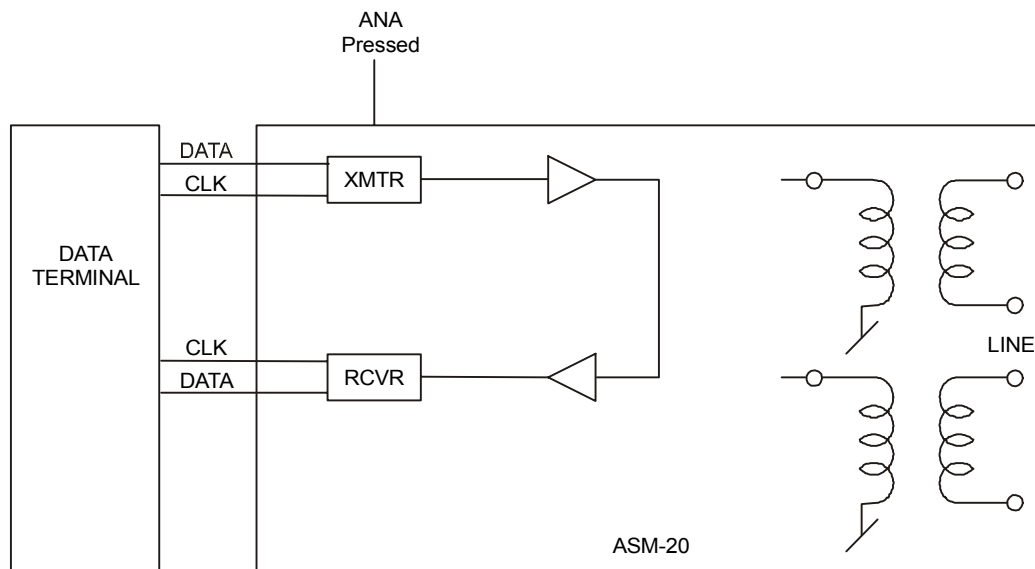


Figure 4-3. Local ASM-20 in Analog Loopback

➤ **To check the performance of the local modem and the local data terminal:**

1. Press the ANA (Analog Loopback) push button on the front panel (see [Figure 3-1](#)). This test can also be activated via the pin on the DTE interface. See [Table 2-2](#) for more information. The TEST LED should turn on. ASM-20 transmit output is now connected to its own receiver (see [Figure 4-3](#)).

2. Check that the DTE is operating properly and can be used for a test. If a fault is indicated, call a technician or replace the unit.
3. Execute the test using one of the methods described below:
  - Use the DTE and check the echoed data stream
  - Use an external Bit Error Rate Tester (BERT) unit
  - Use the internal Bit Error Rate Tester (BERT). Press the PATT push button. The ERR LED will light up briefly to indicate that the LED is functioning. If any bit error is encountered, the LED will blink or remain ON.
4. Perform Step 3 at both ends. If the BERT test equipment does not indicate a fault, but the data terminal does, follow the manufacturer's test procedures for the data terminal and check that the cable connecting the terminal and ASM-20 is working. After completion of the test (or when the fault has been corrected), restore the ANA push button to the OFF position by pressing the ANA push button again. Proceed to [Communication Link Tests](#) below.

---

## 4.5 Communication Link Tests

### Remote Digital Loopback

This test determines the performance of the local and remote ASM-20, and the lines connecting them.

► **To check the performance of the local and remote ASM-20:**

1. Press the REM (Remote Loopback) push button, providing a loopback at the remote ASM-20 (see [Figure 4-4](#)). (This test can also be activated via the pin on the DTE interface.) The TEST LED should light up at both the local and remote units.
2. Perform the BERT test using one of the methods described below:
  - Use the DTE and check the echoed data stream
  - Use an external Bit Error Rate Tester (BERT) unit
  - Use the internal Bit Error Rate Tester (BERT). Press the PATT push button. The ERR LED will light up briefly to indicate that the LED is functioning. If any bit error is encountered the LED will blink or remain ON.
3. If Step 2 indicates a fault, and if the modem test described [Modem Self Test](#) on [page 4-3](#) was positive for both the local and remote modems, the line circuits are not operating properly.

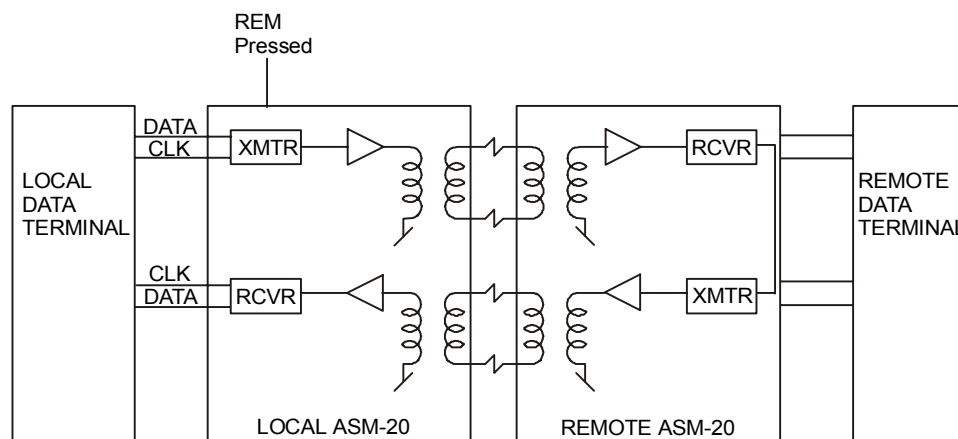


Figure 4-4. Remote ASM-20 in Digital Loopback

## Local Digital Loopback

This test is activated by pressing the DIG push button. It loops the received data back to the remote ASM-20. (This test is equivalent to activating the remote loopback from the remote ASM-20 – see [Figure 4-5](#)). The operator at the remote end can determine the performance of the local and remote ASM-20 units, and the lines between them.

**Note** The modem with the pressed DIG push button must be in RCV or ASY mode

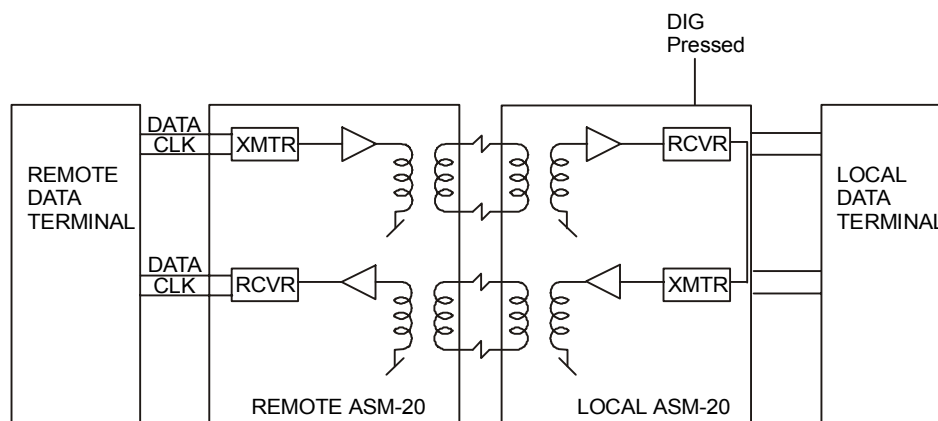


Figure 4-5. Local ASM-20 in Digital Loopback

## 4.6 Frequently Asked Questions

### Q. How is the new version of ASM-20 different from the older version?

A. ASM-20 has been improved in order to get CE mark approval and has some new features. A different ordering name, ASM-20-2, was given to the newer version. Presently, any order received for ASM-20 or ASM-20-2 will be delivered as ordered until the stock of existing ASM-20 products is depleted. After the stock is depleted, orders for any version will be delivered with the new ASM-20-2 boards only.

The following table describe the differences between the old ASM-20 and the new version.

Table 4-1. Differences in Versions

ASM-20	ASM-20-2
Non-modular interfaces (V.24, X.21 etc.); part of the main board	Modular interfaces
Two ordering options for synchronous rates: 32 kbps - 128 kbps 32 kbps - 144 kbps	All synchronous rates from 19.2 kbps - 256 kbps.
No Ethernet support	Ethernet built-in bridge
Metal box	Plastic box
Terminal block with screws	Clip terminal block
Main chip RJ008 and external BERT chip	Main chip RJ016 which includes BERT chip
No CE mark	CE mark
No asynchronous transmission	Asynchronous transmission capability

The above versions are compatible with each other within similar synchronous rates.

Additionally, the ASM-20-2 has been improved in order to get a better line surge protection. In many cases line surges are caused by lightening strikes. The improved line protection of ASM-20-2 complies with the ITU-T/K.21 standard.

The line interface has been modified by adding two Gas surge protection diodes and another two Transorber surge protection diodes. The Gas diodes protect against line surges above 300V and the Transorber diodes protect against surges below 300V.



## 4.7 Technical Support

Technical support for this product can be obtained from the local distributor from whom it was purchased.

For further information, please contact the RAD distributor nearest you or one of RAD's offices worldwide. This information can be found at [www.rad.com](http://www.rad.com) (offices – About RAD > Worldwide Offices; distributors – Where to Buy > End Users).



# Chapter 5

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## Card-Cage Version

This chapter describes the ASM-20/R card version, designed for installation in the ASM-MN-214 card cage. The chapter describes:

- ASM-MN-214 card cage
- ASM-20/R card version
- ASM-20/R power supply
- How to install ASM-20/R.

---

### 5.1 ASM-MN-214 Card Cage

The ASM-MN-214 card cage contains one or two power supplies and up to 14 plug-in cards. The card types can be ASM-20/R or other RAD rack version modems/converters - any combination of up to 14 plug-in cards.

For each of the 14 cards, the rear panel (see [Figure 5-1](#)) contains a male connector for the terminal block and a DB-25 connector. A protection cover protects the terminal block connectors.

The terminal block (see [Figure 5-1](#)) is to be attached to the rear panel terminal block connectors. It contains screws for connecting the transmit and receive pairs and ground, if present.

The 25-pin D-type female interface connector provides all interface signals for the digital interfaces. Modems with X.21 or V.35 interface require an external mechanical adapter. Two optional interface attachments, CIA/V.35/1 and CIA/X.21, can be ordered separately from RAD. CIA/X.21 converts two adjacent DB-25 connectors to two X.21 15-pin connectors. CIA/V.35/1 converts one DB-25 connector to a V.35 34-pin connector. V.36 modem cards are supplied with a RAD adapter cable CBL 530/449F, which converts the DB-25 connector to a V.36 37-pin connector. The adapter cable and two interface attachments are also shown in [Figure 5-1](#).

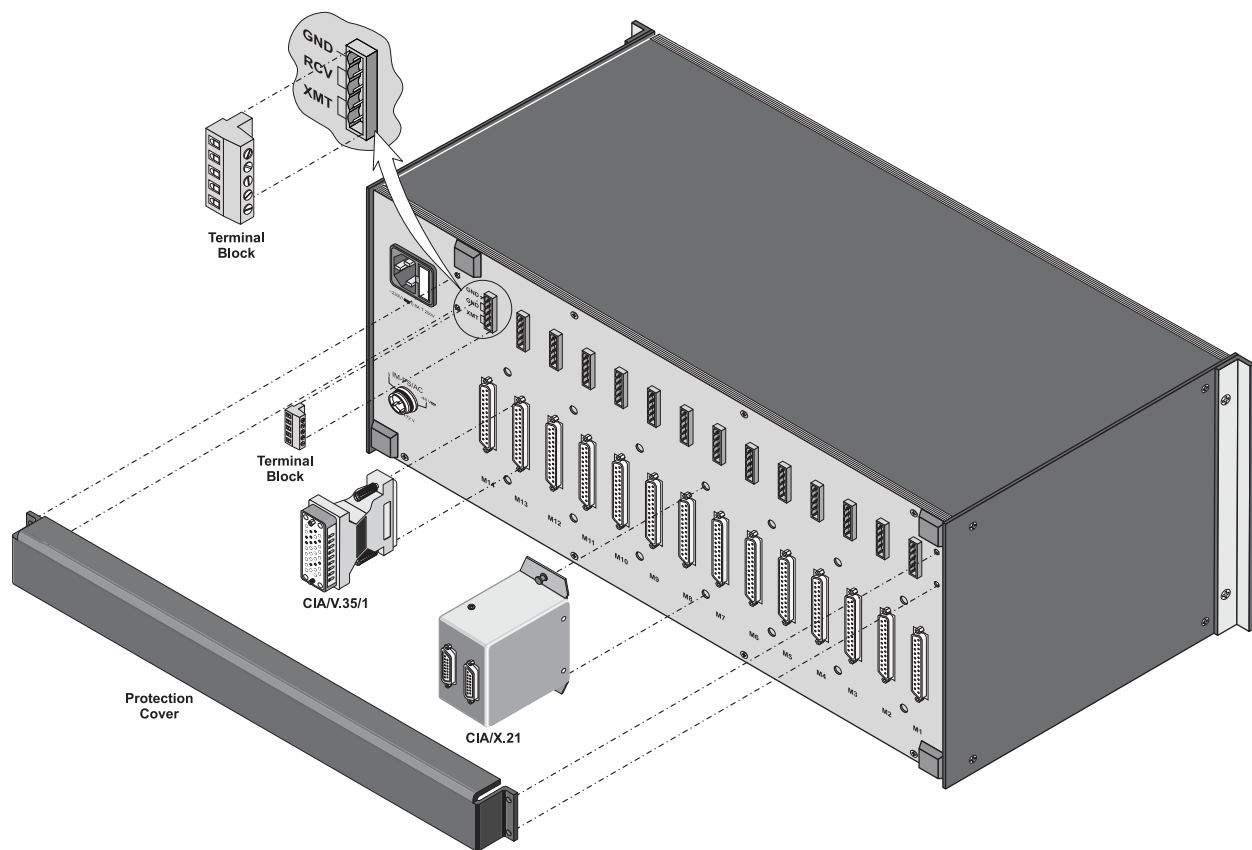


Figure 5-1. ASM-MN-214 Rear Panel

## 5.2 ASM-20/R Card Version

Figure 5-2. ASM-20/R Front Panel

shows the ASM-20/R card front panel. The LEDs and switches of the card version are identical in their functionality to those of the standalone device. For this information, see [Controls and Indicators](#), in [Chapter 3](#).

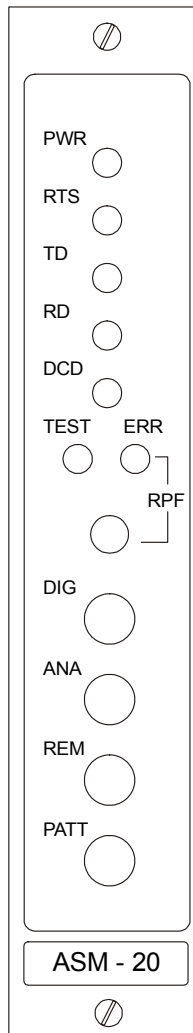


Figure 5-2. ASM-20/R Front Panel

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## 5.3 Power Supply

Power is supplied to the ASM-20/R card from the ASM-MN-214 power supply via the chassis. Each ASM-20/R card has two fuses, which protect the entire system against power failure resulting from a short circuit in one card.

The ASM-MN-214 card cage can accept both AC or DC power supplies. LED indicators located on the ASM-MN-214 front panel (see [Figure 5-3](#)) show activity when the power supply is connected to the mains plug. The power supply supports the full card cage with any combination of cards.

### AC Supply (100, 115 or 230 VAC)

The AC power supply of the ASM-MN-214 is 100, 115 or 230 VAC,  $\pm 10\%$ , 47 to 63 Hz.

### DC Supply (-48 VDC)

The DC power supply is -36 to -72 VDC. It uses a DC/DC converter module to provide the power required for the cards.

### Power Supply with Redundancy

This special ordering option is equipped with two separate power supplies, operating together and sharing the load of the whole card cage. If either of the power supplies fails, the other one will continue to supply power to the full card cage.

Two LED indicators show activity of each power supply. They both light when mains power is provided.

---

**Note** *It is possible to combine AC and DC power supplies in the same cage.*

---



Figure 5-3. ASM-MN-214 Front Panel

---

## 5.4 Installation

► **To install the ASM-20/R card in the ASM-MN-214 card cage:**

1. Install the ASM-MN-214 card cage in the 19" rack.
2. Adjust the jumpers and switches on the card as required (see [Table 2-1](#) and [Figure 2-3](#) in Chapter 2).
3. Insert the ASM-20/R card into one of the ASM-MN-214 slots. Push the bottom of the card into the cage to until it is fully inserted into the edge connector inside the rack. Tighten the screws on the top and on the bottom of each card.
4. Remove the protection cover from the terminal block connectors.
5. Connect the terminal block to the ASM-MN-214 terminal block connector.
6. Connect the line to the terminal block as follows: connect transmit pair to the terminals marked XMT, the receive pair to the terminals marked RCV, and the fifth screw to ground (optional).
7. If required, attach the appropriate CIA (CIA/X.21 or CIA/V.35/1) or V.36 adapter cable to the DB-25 connector on the card cage rear panel.
8. Connect the DTE cable to the DB-25 connector, other side of CIA or adapter cable (depending on your version of the card interface).
9. Connect power to the ASM-MN-214 card cage:
  - To connect AC power, connect the power cable to the mains supply.
  - To connect DC power, refer to [DC Power Supply Connection Supplement](#).



# Appendix A

---

## Ethernet Interface

This appendix:

- Describes the IR-ETH for RAD modems
- Describes the different IR-ETH connector options
- Lists the Ethernet bridge specifications
- Explains how to install and operate an Ethernet bridge.

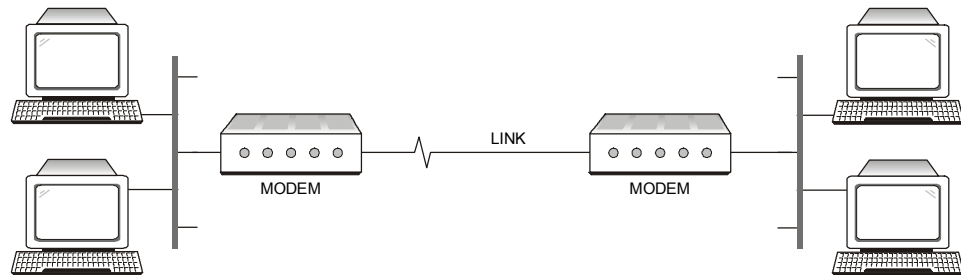
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### A.1 Description

The IR-ETH is an interface module for RAD modems, used for converting the Ethernet (10BaseT or 10Base2) electrical levels to the modem TTL levels. It also converts the Ethernet protocol to HDLC to enable long distance transmission and avoid the Ethernet collision limitation.

The IR-ETH includes an internal, self-learning Ethernet bridge, which enables a high performance link between two Ethernet segments at a low transmission rate. The low-speed HDLC transmission is sent over the link using the modem modulation technique. It is converted back to an Ethernet signal at the remote modem.

*Figure A-1* shows a typical application using an Ethernet interface bridge. Each modem is connected to an Ethernet network via the Ethernet Interface bridge.



*Figure A-1 Ethernet Interface Typical Application*

---

### A.2 IR-ETH Connector Options

*Figure A-2* and *Figure A-3* show the rear panel of ASM-20 with the IR-ETH connector options. The IR-ETH connector for the ASM-20/R card (rack mount version) is shown in *Figure A-4*.

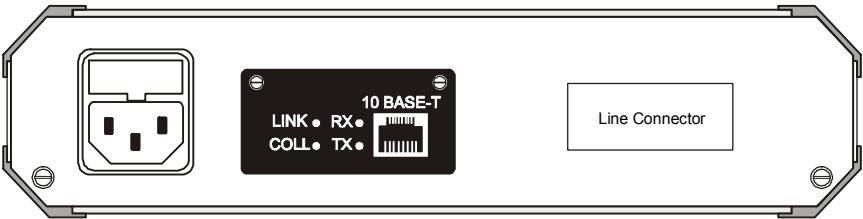


Figure A-2 ASM-20 Rear Panel with IR-ETH/UTP Connector Option

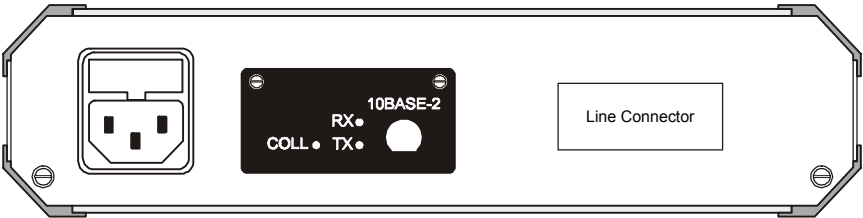


Figure A-3 ASM-20 Rear Panel with IR-ETH/BNC Connector Option

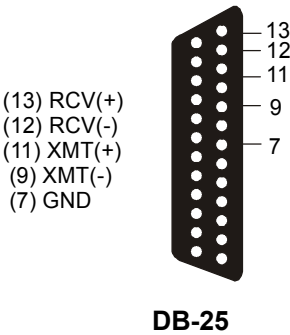


Figure A-4 IR-ETH Connector for the ASM-20 Rack-Mount Version

When using the RJ-45 connector, the customer must prepare a mechanical cable for adapting the DB-25 pinout to that of RJ-45. The pinouts of the DB-25 and RJ-45 connectors are given in Table A-1.

Table A-1 DB-25 and RJ-45 Pin Assignment for IR-ETH Connection

Signal	Pin	
	DB-25	RJ-45
RCV (+)	13	3
RCV (-)	12	6
XMT (+)	11	1
XMT (-)	9	2
GND	7	-

## A.3 Ethernet Bridge Specifications

<b>General</b>	<i>LAN Table</i>	10,000 addresses
	<i>Filtering and Forwarding</i>	15,000 pps
	<i>Buffer</i>	256 frames
	<i>Delay</i>	1 frame
<b>LAN</b>	<i>Standard</i>	Conforms to IEEE 802.3/Ethernet
	<i>Data Rate</i>	10 Mbps (20 Mbps 10BaseT FDX)
	<i>Connectors</i>	10BaseT (UTP): Shielded RJ-45 10Base2: BNC connector
<b>WAN</b>	<i>Protocol</i>	HDLC
	<i>Data Rate</i>	According to the modem transmission rate

## A.4 Installation and Operation

*Figure A-5* and *Figure A-6* show the Ethernet bridge layout, the locations of the DIP switches, and the rear panel components for the UTP and the BNC versions, respectively.

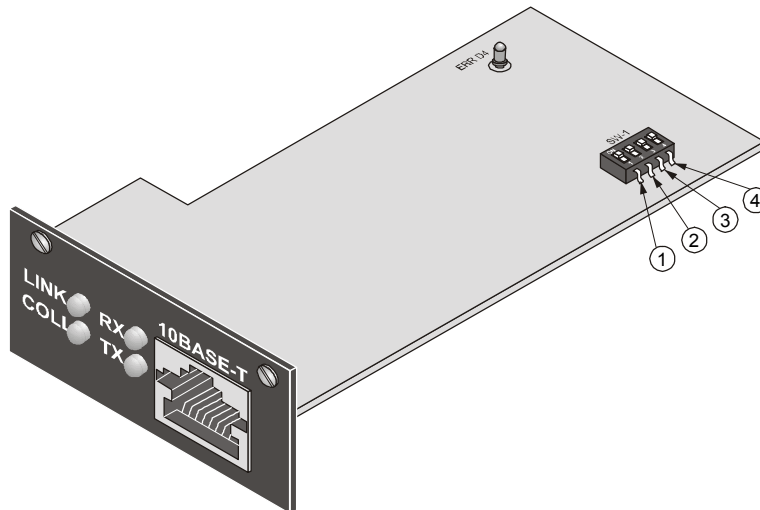


Figure A-5 Ethernet Bridge Layout (UTP Option)

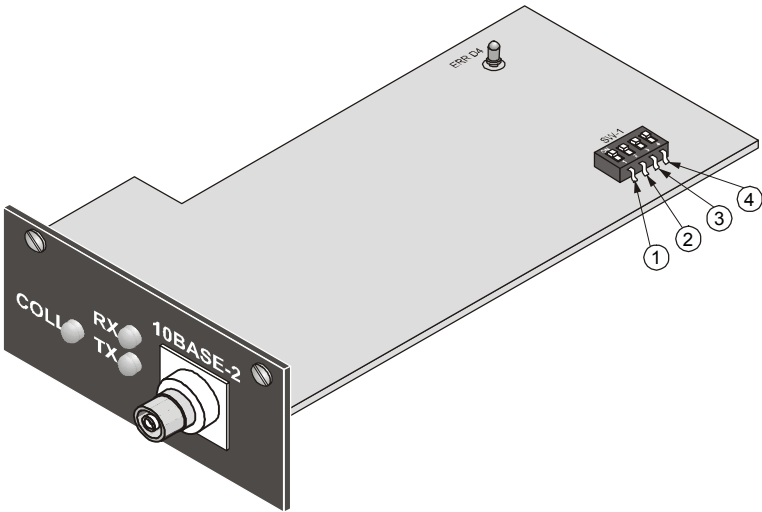


Figure A-6 Ethernet Bridge Layout (BNC option)

LAN Installation

For 10BaseT installation, either a straight cable or a cross-cable may be required. Use a cross-cable when connecting to a port that does not implement the crossover function internally. Otherwise, use a straight cable. (Hubs usually implement the crossover function internally while NICs and other devices do not.)

Switch Settings

Set switches according to Table A-2.

Table A-2 DIP Switches Settings

Switch Number	Name	Description*
1	SQ/FD	<b>ON:</b> Ethernet full-duplex mode <b>OFF:</b> Ethernet half-duplex mode
2	CMP	<b>ON:</b> Strips padding bits inserted in 64-byte frame <b>OFF:</b> Transmits frames over WAN as is
3	FIL	<b>ON:</b> Passes only frames destined for another LAN <b>OFF:</b> Disables LAN filter; passes all frames transparently
4	(nc)	

\* Default settings are shown in bold.

Note

The SQ/FD switch is not used in the Ethernet bridge with the BNC connector option.

LED Indicators

Table A-3 lists the IR-ETH LED indicators and describes their functions.

*Table A-3 IR-ETH Bridge LED Indicators*

LED Name	Description	Location	Color
LINK	ON indicates good link integrity (available only in the 10BaseT version)	Panel	Green
COLL	ON indicates collision on the attached Ethernet segment	Panel	Yellow
RX	ON when data is received from the Ethernet attached segment	Panel	Yellow
TX	ON when data is transmitted from the modem to the Ethernet segment	Panel	Yellow
ERR D4	Bridge buffer overrun	On board	Red



# Appendix B

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## IR-G.703 Codirectional Interface (64 kbps)

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### B.1 Introduction

This appendix:

- Provides a general description of the IR-G.703 codirectional interface (64 kbps)
- Describes the EXT mode
- Describes the INT/RCV mode

---

### B.2 General Description

The IR-G.703 is an interface module for RAD modems, converting G.703 codirectional signals to TTL levels. The converted data is sent over the modem link using the modem modulation technique and converted back at the other end into G.703 64 kbps codirectional signals, or into any other digital interface signal possible. The module is available in the following two versions:

- **The Standalone version** fits into a standalone modem and is available with two types of physical connections: a terminal block or an RJ-45.
- **The Rack version** is mounted on the rack version modem card and uses the modem edge connector for communication. The edge connector is wired, on the motherboard of the card cage, to the DB-25 connector on the back plane of the ASM-MN-214 card cage. [Figure B-1](#) illustrates the pinout of the different connectors.

**Note**

*Byte sync is not kept end-to-end. A violation bit that is inserted every 8 bits does not appear in the same location at the remote side.*

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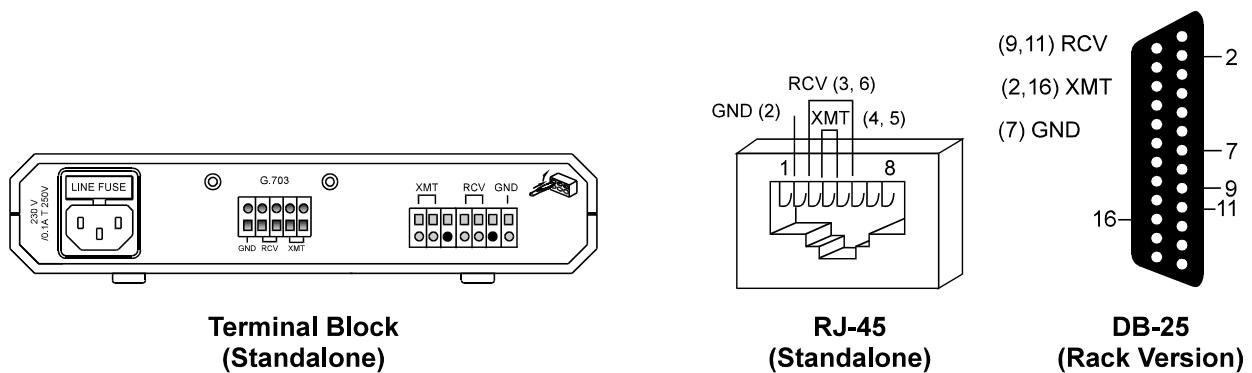


Figure B-1. IR-G.703 Connector Options

**Note**

In [Figure B-1](#), RCV refers to the input signals to the IR module; XMT refers to the output signals from the module.

The IR-G.703 interface module is shown in [Figure B-2](#). It has two operation modes which are selectable on the PCB board. The selection is made by means of the JP1 jumper located within the module as shown in [Figure B-2](#). The EXT mode is described in *EXT Mode* on [page B-2](#) and illustrated by [Figure B-3](#). The INT/RCV mode is described in *INT/RCV Mode* on [page B-3](#) and illustrated by [Figure B-4](#).

**Note**

On a modem with the IR-G.703 module, set jumper J1 (XMT CLK) to the **EXT** position for all clock modes (including INT and RCV.)

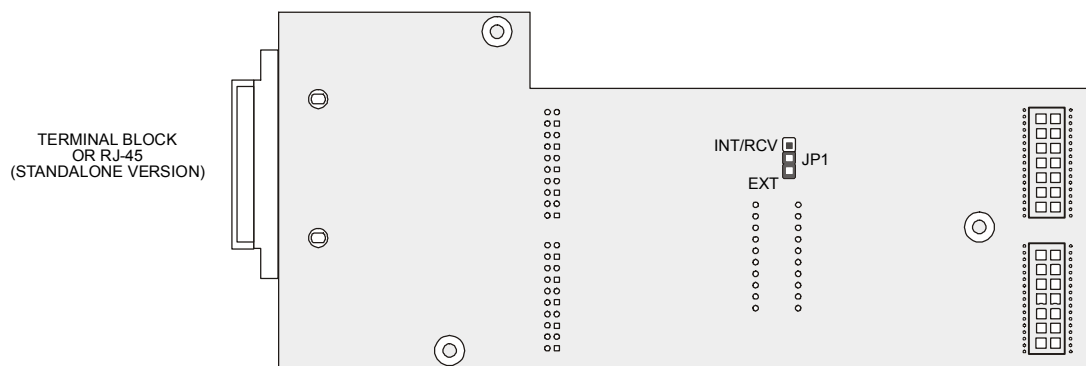


Figure B-2. Location of JP1 on the IR-G.703 Interface Module

## B.3 EXT Mode

This mode is used in applications, where the system timing is provided by the G.703 network. The IR-G.703 module has an internal buffer to compensate for the phase delay introduced to the system by the line delay between the two modems. The buffer is an 8-bit FIFO connected as shown in [Figure B-3](#).

This mode corresponds to the modem clock working in the EXT mode.



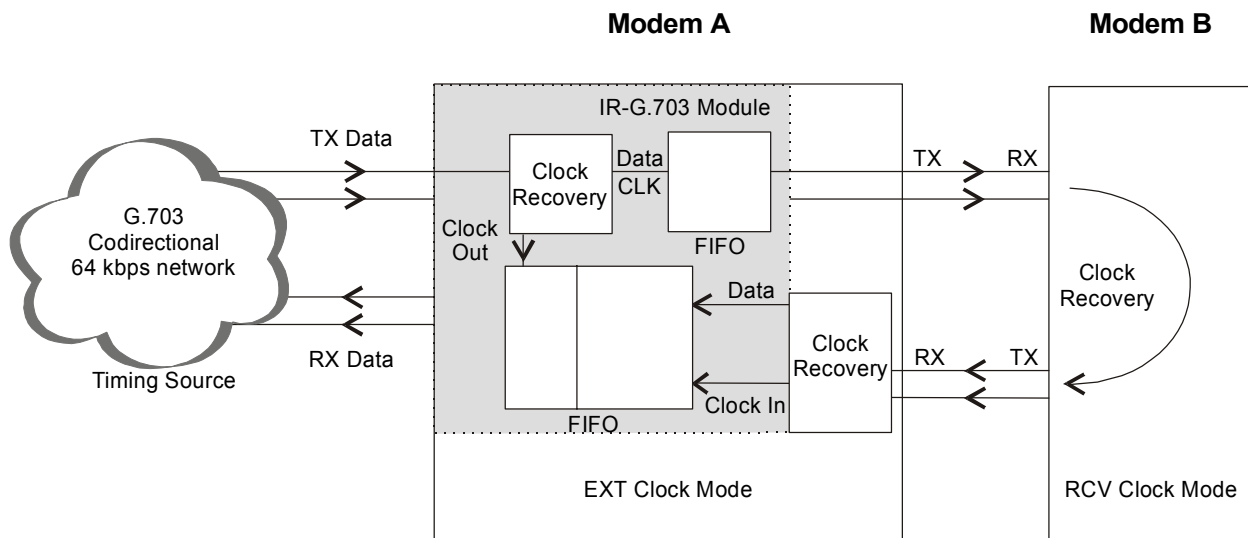


Figure B-3. IR-G.703 EXT Mode Timing Block

## B.4 INT/RCV Mode

This mode is used in applications where the G.703 codirectional 64 kbps equipment connected to the modem recovers the clock signal from the modem link. This mode is used mainly when the attached equipment has a G.703 codirectional interface, but is not able to produce clock signals. The module has a 8-bit FIFO buffer to compensate for the phase delay introduced by the G.703 device. *Figure B-4* illustrates the buffer connection and the required application setup.

This mode corresponds to the modem clock working in the INT or RCV mode.

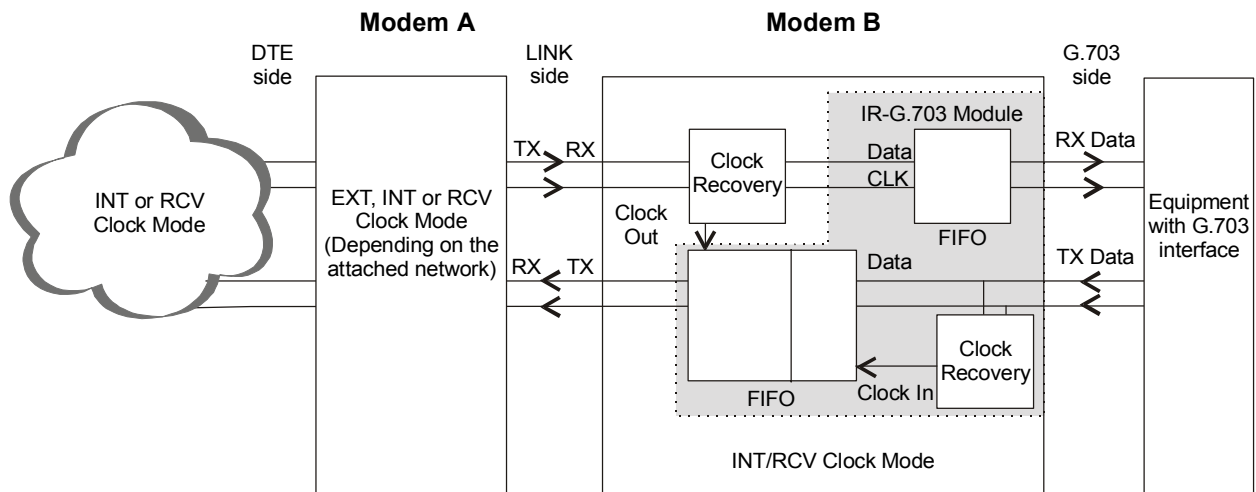


Figure B-4. IR-G.703 INT/RCV Mode Timing Block



# Appendix C

## IR-X.21B Interface Module

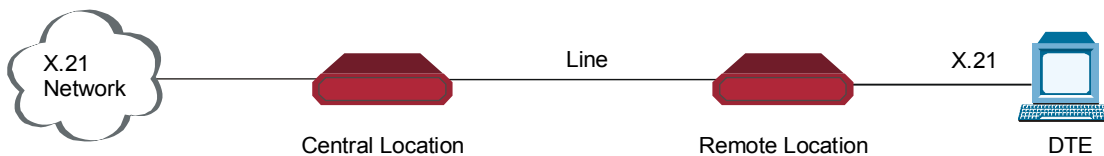
This appendix:

- Provides a general description of the IR-X.21B interface module
- Describes the IR-X.21B connectors and pin assignments
- Describes the IR-X.21B interface module
- Describes the EXT mode for the IR-X.21B
- Describes the INT/RCV mode for the IR-X.21B.

### C.1 Description

The IR-X.21B is an interface module for RAD modems, converting X.21 signals to TTL levels. The converted data is sent over the modem link, using the modem modulation technique, and is converted back at the other end into X.21 signals, or into any other digital interface signal.

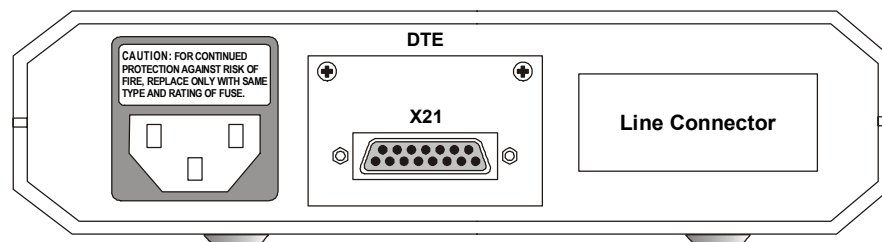
*Figure C-1* shows a typical application of the ASM-20 standalone modem with the IR-X.21B interface module.



*Figure C-1 Typical ASM-20 X.21 Application*

### C.2 IR-X.21B Connectors

*Figure C-2* shows the rear panel of a standalone ASM-20 with the IR-X.21B interface module.



*Figure C-2 ASM-20 Rear Panel with X.21 Connector*

The ASM-20 modem rack version requires an additional adapter to connect between the DB-15 connector of the X.21 equipment to the DB-25 connector of the ASM-MN-214 modem rack. For this purpose, an optional DB-15 attachment CIA/X.21 can be ordered separately from RAD. The attachment connects to the ASM-MN-214 rear panel as shown in [Figure 5-3](#) for the CIA/V.35 attachment.

## Pin Assignment

[Table C-1](#) shows the X.21 DB-15 pin assignment.

*Table C-1 IR-X.21B DB-15 (RS-422) Connector Pin Assignment*

Pin	ID	Function
1	Shield	Chassis connection
2	A	Transmit signal A
3	A	Control A
4	A	Receive A
5	A	Indication A
6	A	Signal timing A
7	A	External Timing
8	GND	Common
9	B	Transmit B
10	B	Control B
11	B	Receive B
12	B	Indication B
13	B	Signal Timing B
14	B	External Timing

## C.3 IR-X.21B Interface Module

The IR-X.21B interface module is shown in [Figure C-3](#). It has two operation modes which are selectable on the PCB board. The selection is made by means of the JP2 jumper located within the module as shown in the figure. The EXT mode is described on [page C-3](#) and illustrated in [Figure C-4](#). The INT/RCV mode is described on [page C-4](#) and illustrated in [Figure C-5](#).

### **Note**

*The X.21 interface should be in accordance with the modem clock mode. For example, if the modem is in the EXT mode, then JP2 should be set to the EXT position.*

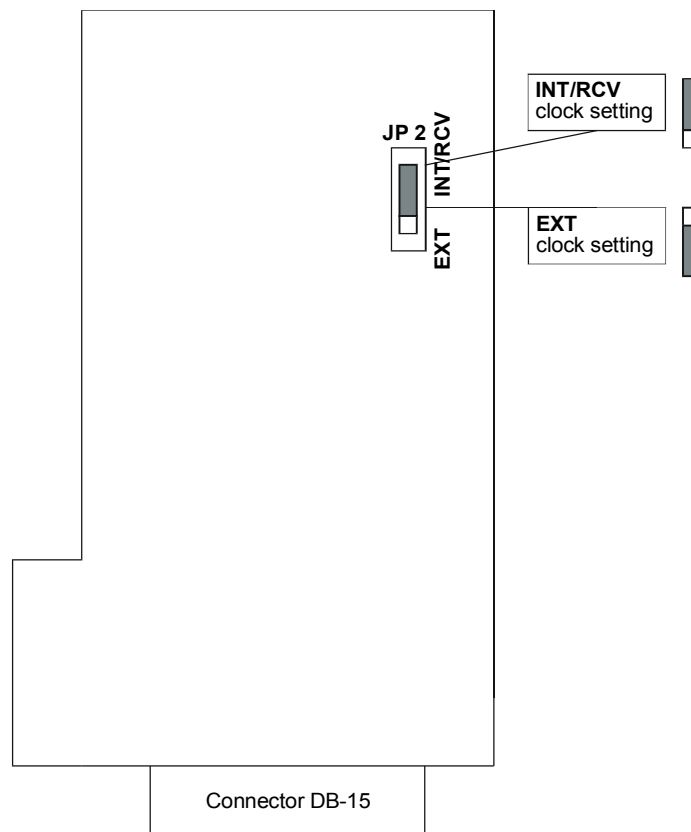
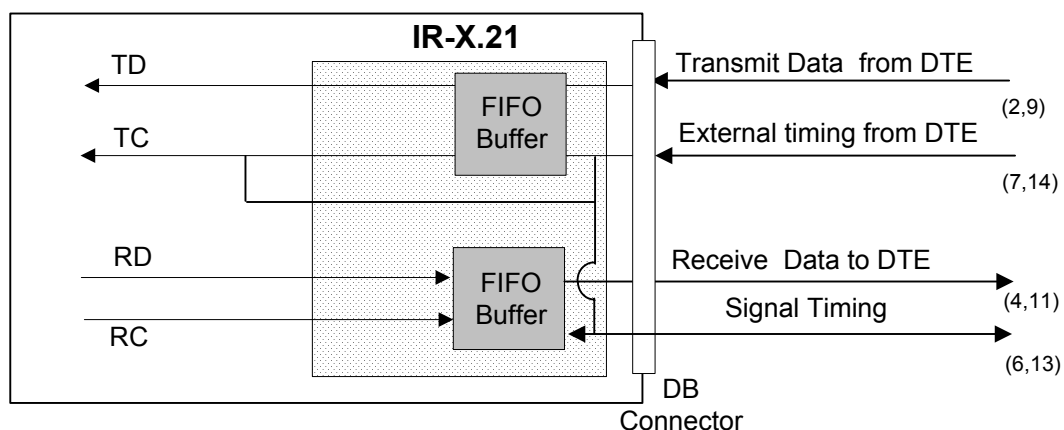


Figure C-3 Location of Jumper JP2 in the IR-X.21B Interface Module

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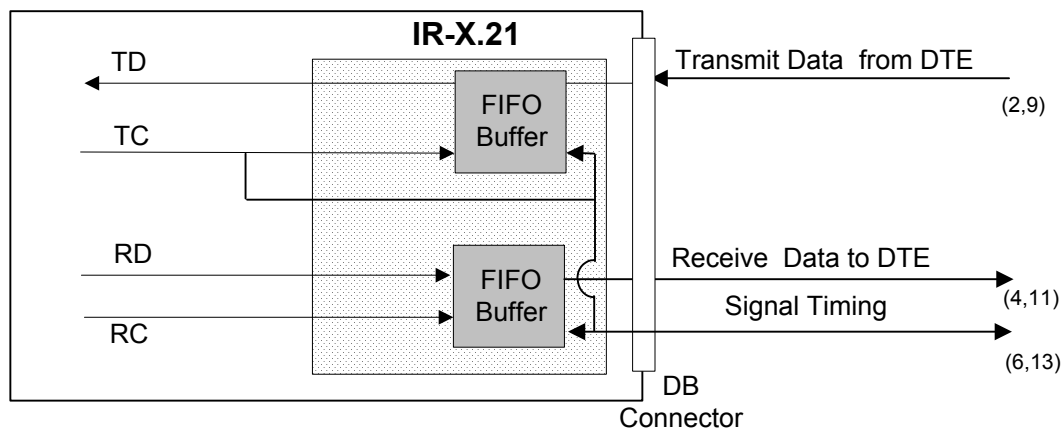
## C.4 EXT Mode

This mode is used in applications of X.21 networks where the system timing is provided by the X.21 network. The IR-X.21B module has internal buffers to compensate for the phase delay introduced to the system by the line delay between the two modems. The buffers are 16-bit FIFO's connected as shown in [Figure C-4](#). When the modem's clock mode is EXT, the JP2 jumper must be set to EXT (see [Figure C-3](#)).

**MODEM (EXT)***Figure C-4 EXT Mode Timing Block***C.5 INT/RCV Mode**

This mode is used in applications where the IR-X.21B side uses the clock signal from the modem link. This mode is used mainly when the attached equipment has an IR-X.21 interface, but no ability to produce clock signals. The module has two 16-bit FIFO's buffers to compensate for the phase delay introduced by the X.21 device.

*Figure C-5* illustrates the buffers connection and the required application setup. When the modem's clock mode is INT or RCV, the JP2 jumper must be set to INT/RCV (see *Figure C-3*).

**MODEM (INT or RCV)***Figure C-5 INT/RCV Mode Timing Block*

# Appendix D

---

## DTE Interface Connectors

*Table D-1* lists detailed information about each DTE interface connector.

Table D-1. Interface Signal List (Female Connectors) Pinout and Standard Signal Names

Signal Function	RS-232		V.35		EIA-530		X.21		Description
	DB-25 Standalone and Frame	DB-25 Frame	34-pin Standalone Pin	34-pin Standalone Circuit	DB-25 Standalone and Frame Pin	DB-25 Standalone and Frame Circuit	DB-25 Frame	DB-15 Standalone Pin [Function]	
Protective Ground	1	1	A	Frame 101	1		1	1 - [SHIELD]	Chassis ground. May be isolated from Signal Ground. See <a href="#">Table 2-1</a> .
Signal Ground	7	7	B	Signal Ground 102	7	AB	7	8 - [GND]	Common Signal and DC power supply ground.
Transmitted Data	2	11 9	S P	TD(B) 103 TD(A) 103	2 14	BA(A) BA(B)	2 14	2 T(A) 9 T(B) [TRANSMIT]	Serial digital data from DTE. The data transitions must occur on the rising edge of the transmit clock.
Received Data	3	12 13	R T	RD(A) 104 RD(B) 104	3 16	BB(A) BB(B)	3 16	4 R(A) 11 R(B) [RECEIVE]	Serial digital data at the output of the modem receiver. The data transitions occur on the rising edge of the receive clock.
Request to Send	4	4	C	RTS 105	4 19	CA(A) CA(B)	4 19	3 C(A) 10 C(B) [CONTROL]	A positive level to the ASM-20 when data transmission is desired.
Clear to Send	5	5	D	CTS 106		CB(A) CB(B)			A positive level from the ASM-20 with delay, after receipt of Request to Send, and when the ASM-20 is ready to transmit.
Data Set Ready	6	6	E	DSR 107	6 22	CC(A) CC(B)			A positive level from the ASM-20 when the power is on, and the ASM-20 is (a)not in the DIGITAL LOOP mode, or (b) has not received a REMOTE LOOPBACK signal from the remote unit.
Data Terminal Ready	20	20	H	DTR 108	20 23	CD(A) CD(B)			Not used.



Table D-1. Interface Signal List (Female Connectors) Pinout and Standard Signal Names (Cont.)

	RS-232	V.35		EIA-530		X.21		
Signal Function	DB-25 Standalone and Frame	DB-25 Frame	34-pin Standalone Pin Circuit	DB-25 Standalone and Frame Pin Circuit	DB-25 Frame	DB-15 Standalone Pin Circuit [Function]	Description	
Carrier Detect	8	8	F DCD 109	8 CF(A) 10 CF(B)	8 10	5 I(A) 12 I(B) [INDICATION]	A positive level from the ASM-20, except when a loss of the received signal is detected, or when Data Set Ready is negative.	
External Transmit Clock	24	19 16	U SCTE(A) 113 W SCTE(B) 113	24 DA(A) 11 DA(B)	24 11	7 (A) 14 (B)	A serial data rate clock input from the data source. Positive clock transitions must correspond to data transitions.	
Transmit Clock	15	14 10	Y SCT(A) 114 A SCT(B) 114	15 DB(A) 12 DB(B)	15 12	6 S(A) 13 S(B) [SIGNAL TIMING]	A transmit data rate clock for use by an external data source. Positive clock transitions correspond to data transitions.	
Receive Clock	17	22 23	X SCR(B) 115 V SCR(A) 115	17 DD(A) 9 DD(B)			A receive data clock output for use by external data sink. Positive clock transitions correspond to data transitions.	
Local Analog Loop	18	18	L and j 141	18 LL			A control signal input; when on, commands the ASM-20 into Local Analog Loopback (V.54 Loop 3). See Table 2-2.	
Remote Loopback	21	21	N and h 140	21 RL			A control signal input; when on, commands the ASM-20 to send a remote Loopback command (V.54 Loop 2) to the remote ASM-20. See Table 2-2.	
Test Indicator	25	25	n and k 142	25 TM			A control signal output from the ASM-20; positive during any test mode.	



# Appendix E

## Connection to RS-422

*Table E-1* describes how to connect ASM-20 (EIA 530) to a RS-422 (V.36) DTE.

*Table E-1. Interface List for Connecting ASM-20 (RS- 530) to RS-422 (V.36) DTE*

Signal Function	RS-449 (RS-422/423) 37 Pins		EIA 530 DB-25 Female Standalone and Frame	
	Pin	Circuit	Pin	Circuit
Protective Ground	1	Shield	1	
Signal Ground	19	SG	7	AB
DTE Common Return	37	SC		
DCE Common Return	20	RC		
Transmitted Data	4	SD (A)	2	BA (A)
	22	SD (B)	14	BA (B)
Received Data	6	RD (A)	3	BB (A)
	24	RD (B)	16	BB (B)
Request to Send	7	RS (A)	4	CA (A)
	25	RS (B)	19	CA (B)
Clear to Send	9	CS (A)	5	CB (A)
	27	CS (B)	13	CB (B)
Data Set Ready	11	DM (A)	6	CC (A)
	29	DM (B)	22	CC (B)
Data Terminal Ready	12	TR (A)	20	CD (A)
	30	TR (B)	23	CD (A)
Carrier Detect	13	RR (A)	8	CF (A)
	31	RR (B)	10	CF (B)
External Transmit Clock	17	TT (A)	24	DA (A)
	35	TT (B)	11	DA (B)
Transmit Clock	5	ST (A)	15	DB (A)
	23	ST (B)	12	DB (B)
Receive Clock	8	RT (A)	17	DD (A)
	26	RT (B)	9	DD (B)
Local Analog Loopback	10	LL	18	LL
Remote Loopback	14	RL	21	RL
Test Indicator	18	TM	25	TM



# Appendix F

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## Unit Case Assembly

This appendix:

- Describes the unit case
- Describes how to install the unit case into a 19-inch rack.

---

### F.1 Unit Case

The unit case design facilitates quick access to the interior strappings as well as easy installation into a 19-inch rack.

---

### F.2 Installation of the Unit Case into a 19-inch Rack

The height of the unit is 1U (1.75 in); the width of the unit is slightly less than half the available mounting width. A rack adapter kit, RM-17, is available for installing either a single unit or two units side by side in the 19-inch rack.

---

**Caution** Disconnect AC power before opening the unit.

---

#### Installing a Single Unit

Rack adapter components for installing a single unit include one short bracket and one long bracket. Each bracket is fastened to the side walls of the unit by two screws (with flat washers) which are inserted into the two front holes on the side wall (The unit is supplied with nuts already in place on the inner side wall). Note that the short bracket fastens to the left side of the unit, and the long bracket to the right side of the unit. See [Figure F-1](#). Installing a Single Unit

#### Installing Two Units

Rack adapter components for installing two units include: two long side rails (one for each unit) that slide into each other fastening the two units together, and two short side brackets which hold the two units in the 19-inch rack. See [Figure F-2](#).

Once the brackets are fastened to the side walls, the unit is ready for installation in the 19-inch rack. Place the unit in the rack and fasten the brackets to the side rails of the rack by means of the two screws situated on each side (not included in the kit).

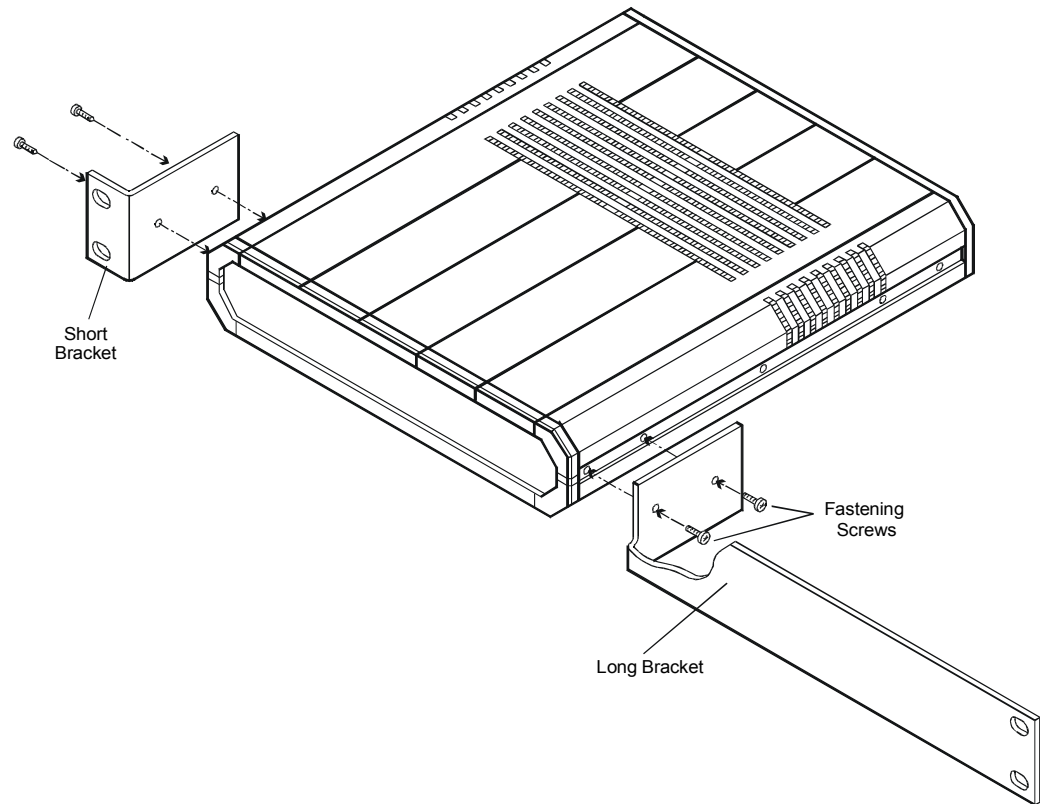


Figure F-1. Installing a Single Unit

## Installing Two Units

Rack adapter components for installing two units include: two long side rails (one for each unit) that slide into each other fastening the two units together, and two short side brackets which hold the two units in the 19-inch rack. See [Figure F-2](#).

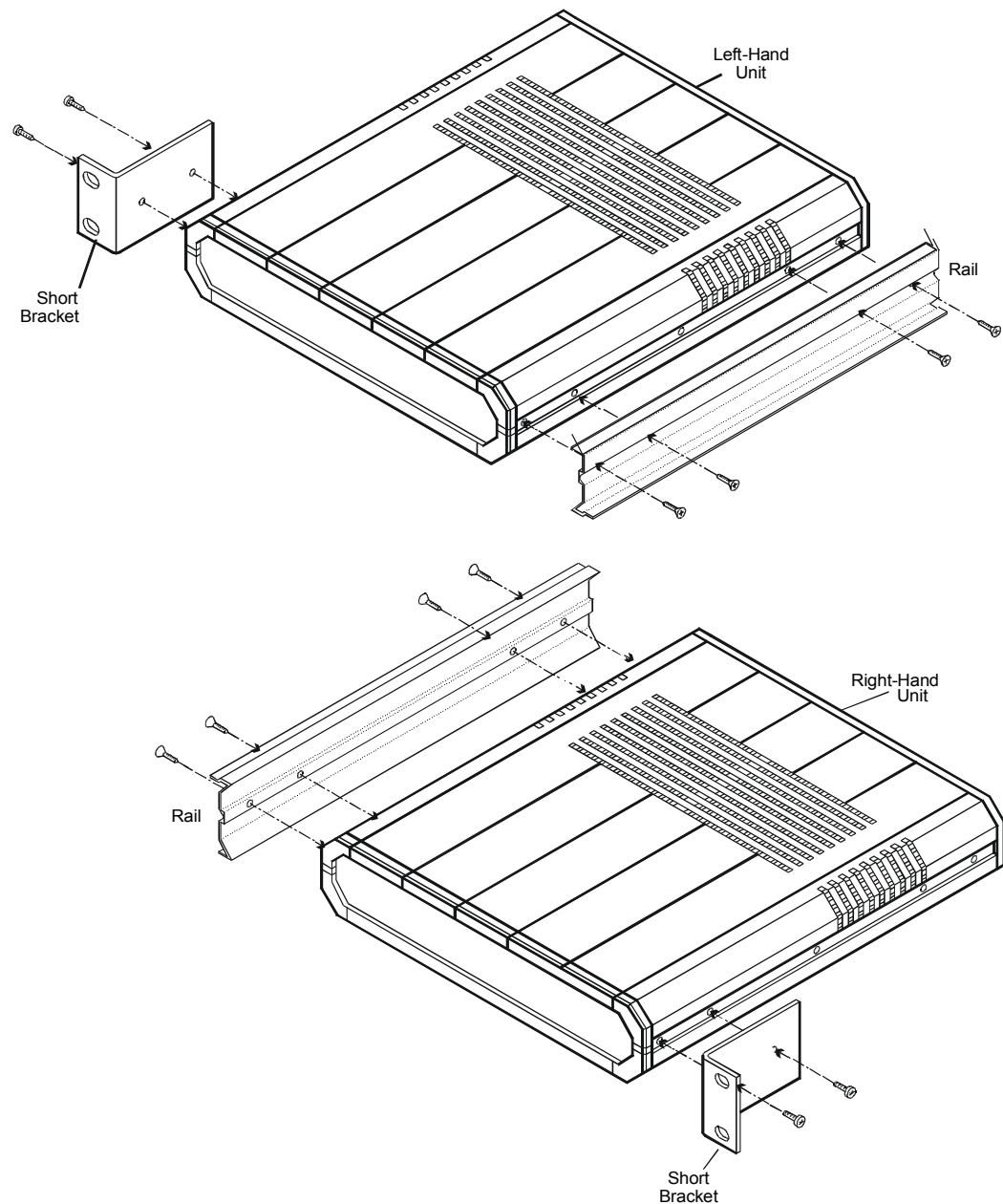


Figure F-2 Rack Adapter Components for Installation of Two Units

► **To install two units:**

1. Fasten one long side rail to each unit (right side to one unit, left side to the other unit) using the four screws and flat washers supplied. The side rails must be attached in opposing fashion, the narrow flange of the first rail opposite the wide flange of the second rail.
2. Attach one short bracket opposite the side rail on each unit using the four screws and flat washers supplied.
3. Slide the side rail of one unit into the side rail of the other unit, fastening the two units together (See [Figure F-2](#). Installing Two Units)

4. ).
5. Secure the supplied plastic caps to the ends of the rails, to prevent the units moving and to protect the rail ends.
6. Place the assembled units in the rack and fasten the brackets to the side rails of the rack, by means of the four screws situated on each side (not included in the kit).

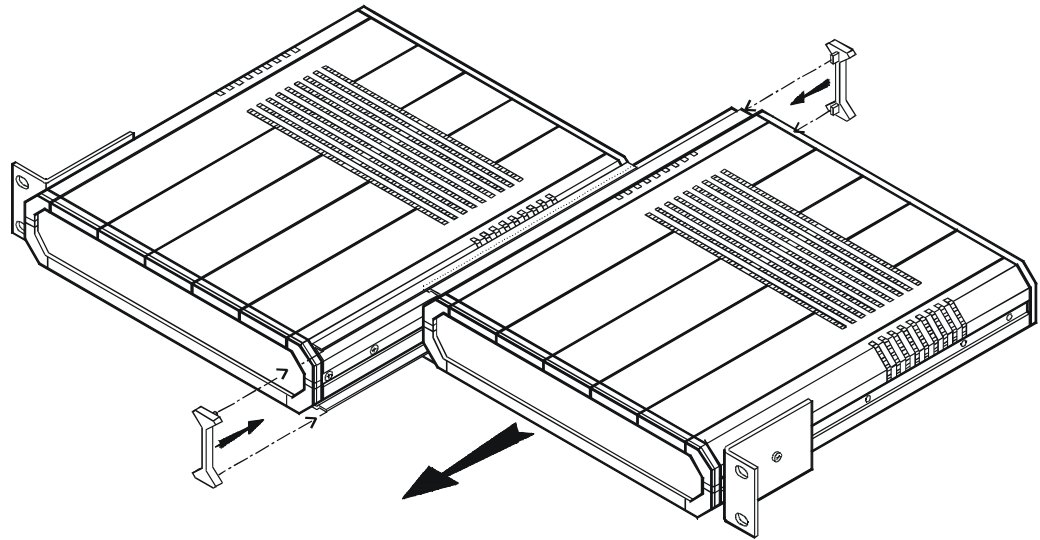


Figure F-2. Installing Two Units



# Customer Response Form

RAD Data Communications would like your help in improving its product documentation. Please complete and return this form by mail or by fax or send us an e-mail with your comments.

Thank you for your assistance!

Manual Name: ASM-20

Publication Number: 601-200-09/05

Please grade the manual according to the following factors:

	<i>Excellent</i>	<i>Good</i>	<i>Fair</i>	<i>Poor</i>	<i>Very Poor</i>
Installation instructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operating instructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manual organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Illustrations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The manual as a whole	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What did you like about the manual?

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## Error Report

- Type of Error(s)  
or Problem(s):
- ☐ Incompatibility with product
  - ☐ Difficulty in understanding text
  - ☐ Regulatory information (Safety, Compliance, Warnings, etc.)
  - ☐ Difficulty in finding needed information
  - ☐ Missing information
  - ☐ Illogical flow of information
  - ☐ Style (spelling, grammar, references, etc.)
  - ☐ Appearance
  - ☐ Other \_\_\_\_\_

Please list the exact page numbers with the error(s), detail the errors you found (information missing, unclear or inadequately explained, etc.) and attach the page to your fax, if necessary.

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Please add any comments or suggestions you may have.

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- You are:
- ☐ Distributor
  - ☐ End user
  - ☐ VAR
  - ☐ Other \_\_\_\_\_

Who is your distributor? \_\_\_\_\_

Your name and company: \_\_\_\_\_

Job title: \_\_\_\_\_

Address: \_\_\_\_\_

Direct telephone number and extension: \_\_\_\_\_

Fax number: \_\_\_\_\_

E-mail: \_\_\_\_\_







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